Project Deliverable D: Conceptual Design

University of Ottawa

GNG1103: Intro to Engineering Design

Group 8 - BOOM

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October 13, 2024

Abstract

Deliverable D focuses on generating conceptual ideas from existing design requirements and criteria. By grouping certain design criteria into one subsystem, each member of Group 8 generated at least one conceptual design per subsystem. These include storyline, interaction between players, players' interaction with the game, and the implementation of Robomaster S1. By making amalgams of different ideas, three global concepts are derived from, which are then compared to interpreted needs and established metrics. One of the three concept, which is decided from a group vote, is then chosen to remain for further design phases.

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Introduction

Group 8 has completed Deliverable B and Deliverable C, which focused on interpreting user needs and deriving design requirements for the project. Such requirements are grouped into functional requirements, non-functional requirements, and constraints. Expected metrics are also assigned to relevant requirements for further development.

With clear definitions of what required by the client, combined with additional requirements we have set up to ensure the quality of our product, each member of Group 8 has generated at least one concept for each of the four subsystems for our final product. The four subsystems include:

1. Storyline
2. Interaction between Players
3. Players' Interaction with the Game (how each part of the experience will proceed, how each physical aspect of the experience would work)
4. Implementation of Robomaster S1

The conceptual subsystems are then mix-and-matched, generating three global concepts. Based on information and data acquired from our previous deliverables, each design will be evaluated by each functional requirement, non-functional requirement, and constraint. A final global concept is selected from such evaluation.

1.1 Related Work

Three deliverables have been completed prior to Deliverable D, with certain deliverables imperative to the current stage in development, these include:

Deliverable B: This deliverable list user requirements we have collected during the Client Meeting. With further interpretation on the requirements, we also included additional ones to ensure the quality of the final product. Additionally, a problem statement is created to summarize the general requirements.

Deliverable C: This deliverable adds on to Deliverable C by assigning expected metrics to design requirements. The requirements are then ordered in a priority list to generate major focus points of our design. Benchmarking is also expanded by evaluating existing products with our expected metrics. This allows us to better understand whether it is reasonable to set such standards for our final product.

Individual Ideas

2.1 Primary Idea 1 – The Extraction (Isaac Chan)

2.1.1 Storyline

Prior to the story, the players will be randomly assigned a role. (refer to Appendix I). The story begins with each character at their assigned starting points. (e.g. child begins at school, adult begins at grocery store, and tourist begins at landmark.) The characters will not have any impact on the outcome of each player, and their decisions in the experience will be the only factor in how the story progresses.

A loud explosion can be heard from afar, and the players receive a emergency alert from their phones -- the LAWS has been activated by a neighbouring country. The alert also provided a rendezvous location for citizens still in open areas. The players then must evade the LAWs, which will scout the streets of the urban city. At this early stage, players are still separated and will not be eliminated under any circumstances.

By completing their tasks and making to the first rendezvous point, all players will meet and begin group tasks. In each task, players will be forced to make ethical choices. For example, the LAWS will target the child and the elderly, and the player will have to make a choice on who to save. Regardless of their choice, the LAWS will kill another separate member of the group, demonstrating the dehumanization aspect of the LAWS. At this stage, players will be either "killed" by the LAWs, or equivalent tragic events. The consequence of each choice gets more severe as the game proceeds, from having the possibility of elimination, to guaranteed possibility of elimination.

After completing a certain number of tasks, the surviving players (ideally two players) will be redirected to the landmark, where they will be extracted from the battlefield. As the rescue squad arrives, the LAWs will have arrived on site. The final players will be evaluated based on a tally of how many eliminations they have deliberately caused from previous tasks. The players will get a chance to plead their cases. Nonetheless, the LAWS will then eliminate the player who caused the least elimination, demonstrating that the relationship with technology was never built on emotional connection like humans, and that they have a lack of human judgement and understanding. The surviving players are then extracted to safety.

In the epilogue, it is stated that the victims of the LAWS have been branded as criminals, terrorists and rebels. This lie justifies the LAWS. The surviving players are then eventually eliminated by the LAWS activator, as they are the only survivors that are aware of the true nature of LAWS. The LAWS activator does not suffer any consequence for their actions, and with their web of lies, they will never suffer any consequences at all.

2.1.2 Interaction Between Players

In general, players will converse with each other verbally. However, an additional method of interaction is also included – private messages.

While each player begins at a different location on the map, the entire map is merely 20ft x 20ft, and players will eventually meet and work as a group. Each player will have 1 chance overall to send one-way private messages to another player during the decision-making process, and the receiver can reply without using up the message quota. For each message, the players will be separated by the person-in-charge (PIC), who will then verbally recap the message to the receiver and does so similarly for the replies.

This can enhance the realism of the experience, by having the choice of "deals" being made behind the scenes. This can also show how humans, while empathetic, may often choose personal gain over the greater good. While this does not demonstrate the LAWS' ethical concerns, each message would secretly count as a tally on causing the elimination of another player. The surviving player will be the only player told of this tally, enhancing the feeling of guilt at the end of the experience.

2.1.3 Players' Interaction with the Game

2.1.3.1 Environment

In the experience, the area would be based on the design of a Monopoly Board, where different locations in the city would be located at different points within the 20ft x 20ft area. Each location will have a laser-engraved sign to indicate the location. There will also be physical obstacles to allow users to evade the LAWS, specifically made with simple curtains.

2.1.3.2 Character Cards

To enhance the immersive aspect of the experience, players will be assigned a character (see Appendix I). The character cards will be laser-engraved on a piece of MDF. As previously mentioned, the characters will not have any impact on the outcome of each player, and their decisions in the experience will be the only factor in how the story progresses. The character cards will also include the setting of the story, their goals, and the initial instructions.

In addition, players will be required to wear a vest with a particular symbol on their bodies. This is simply used for the Robomaster to identify players from each other, allowing the Robomaster to easily decide which target to eliminate.

2.1.3.3 Tally System

As mentioned in the story, the final decision of the game will not be made by the players, but rather by the Robomaster. This will be done so by evaluating a tally system. In each decision-making process, the PIC will mark down whether a player deliberately made a choice that directly led to another's elimination. Any private messages made with another player will also automatically count as one tally. The player with the least number of tallies will then be decided as the final victim.

The tally system will not be revealed to the players until the very end of the experience. The part where private messages are equivalent to one tally will be only revealed to the surviving players, enhancing the feeling of guilt.

2.1.3.4 Person-In-Charge (PIC)

The players will receive instructions and be allowed to send private messages from time to time. The PIC will only physically appear in specific moments in the story, the beginning of the story, during each decision-making process, and the epilogue. The PIC provides the setting for the story and the background for each decision. In each decision-making process, the PIC will separate the players. The players will then have the chance to send a private message, but not required to do so. If a message is sent, the PIC will then transfer it to the receiver and bring the response back to the sender. If not, the story continues.

It is possible for multiple PICs to be present at the experience, but that is to be determined by future testing.

2.1.4 Implementation of Robomaster S1

2.1.4.1 Movement

The configurations of the Robomaster S1 are stated in Appendix II.

The Robomaster S1 will be used in the experience as a scouting system, eliminating targets on sight. Given the Robomaster S1's limited chassis speed and the limited experience area, it is nearly impossible for a chase between the players and the Robomaster S1 to occur. As a result, the players can only evade the Robomaster S1 by hiding behind obstacles.

2.1.4.2 Media

The Robomaster S1 has two major media systems, audio and video.

The audio system will be used to broadcast specific gunshot sounds and explosion to indicate certain events. The epilogue will also be more Robomaster-oriented, with the Robomaster broadcasting audio descriptions of the events following the extraction.

The video system of the Robomaster is rather limited and the built-in camera will only be used to identify each player with simple symbols.

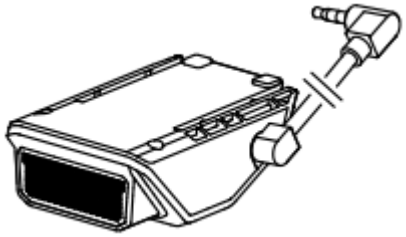

Figure 1: Speaker of the Robomaster S1

Taken from the DJI Robomaster S1 User Manual

2.2 Primary Idea 2 – The End Is Near (Spencer Irwin)

2.2.1 Storyline

Before the game being's player will be assigned a role (refer to Appendix I). Based off the role they were assigned they'd also be a assigned a starting location. (University, Grocery stores, Mall, landmarks, Home) The characters roles themselves will not have an impact on the game, but the starting location could determine how long your able to survive.

In the a near-future, two powerful nations, have been locked in a brutal war for years. In a desperate attempt to change the outcome of the war, the first Nation reveals its latest weapon, a fully autonomous killer robot known as the LAWS. It has been programmed to eliminate anything it thinks is an enemy, the LAWS's are deployed deep into 'enemy' territory, where it kills everything in its line of sight, including innocent civilians, making them practically unstoppable.

The game puts you in the shoes of an innocent civilian caught in the chaos, as the LAWS's ravages your hometown. As the LAWS's being to enter your city, you the player will start in a randomized location, a school, grocery store, government building, or some other landmark. Your objective is to make it to a designated extraction point, where a rescue force is waiting to save survivors from the LAWS's attacks.

The way the game works is like a Dead Zone Chess. It is a strategic board game with a deadly twist: an autonomous killer robot, LAWS's patrols the board, and any player who moves their pieces within its "kill zone" is instantly eliminated. The goal of the game is to be able to find a way around the LAWS's robot without entering its kill radius. Along with the LAWS's you will also have to work together with the other players to hopefully all make it to the extraction point where you'd only then be able to leave.

2.2.2 Interaction Between Players

The main ‘Currency’ in this game is your turns.

You the player have the options to:

- Sacrifice one of the players for all the players to have an extra move (Group vote).
- Give another player you move for that round.

If a player feels the need, they are able to have the option to sacrifice one of their teammates for an extra move (The whole group other the sacrifice must agree on this), or a player is able to self-sacrifice themselves for the same purpose of giving all their teammates an extra turn that round. This could be very beneficial if all the players are bound to die, and they can only survive if they have 2 consecutive turns.

As well players have the option to give their teammates their turn for that round, essentially giving the others a better chance to get out of a sticky situation. But you must be careful as this can end up putting you in danger as you will not be able to move at all that round.

2.2.3 Players’ Interaction with the Game

The game itself will be in a city that is being to turn to rubble within a chess-like grid. Certain sections of the grid will be mark with locations where players will begin their escape.

The way that the player will be able to interact with the game is their movement. As it will be a chess-like board where the player is able to move one tile at a time in any direction any time it is their turn, their objective will be to find a way to creep around the board to escape the LAWS without entering its ‘kill radius’.

2.2.4 Implementation of Robomaster S1

With its sound effects, movement, and human targeting, the Robomaster will be the centerpiece of the game, as it will be the only thing that the players are trying to avoid. Although the sensors on the Robomaster are rather few, its ability to see other players will make it extremely useful for this game.

The robot itself will start at the back middle of the board, and it will slowly make its way up the board looking for players in its radius as the game progresses. Each round the robot will be able move left, right, or forward (No diagonal or backwards movement) slowly moving closer to the players. If a player were to enter the bot's radius they would instantly be killed.

The last effect of the Robomaster on the game will be its built-in speakers. This will allow us to play audio and eerie sounds as it moves and patrols, making the game more realistic and immersive.

2.3 Primary Idea 3 – The “Grand” Escape (Trevor Lo)

The idea for the game is the initial attack from autonomous weapons. The environment is centered around the beginning of collapse of society caused by autonomous weapons. The setting showcases the progressively destruction of buildings, with the player's goal is to survive the initial strike and escape the targeted strike range. Autonomous weapons do not care who will be targeted, that players can immerse themselves in an interactive environment, and experience the catastrophes firsthand.

2.3.1 Storyline

At the beginning of the game, players will randomly pick a character card. Indicating its starting position of the game, its skills and weakness. The storyline of the game is simple. Players need to survive the

attack, and escape through the escape points located on the map. Throughout the entire game, event cards will be picked with different conflicts in between. Some will be the direct destruction of the robot causing some pathways to be blocked, that players must go around. Other events will be survival and conflict between players and NPC. This includes moral questions such as sacrificing a player to save others, fighting for a one-use passage, etc. At escape locations that may require tools and tasks done before allowing them to escape. For example, in a boat escape point, the players are required to acquire gas to activate the engine and escape. Remind that there will be limited spots for survival, that some players may end up with no escape roots and are automatically lost. In the aftermath of the game, the players will be indicated that no one will be responsible for the thousands of deaths during the attack. Consequences done by the actions of the players will be concluded, and all of them will be tragic to further emphasize the dark side of war.

2.3.2 Interaction Between Players

If players intend to act on other players, such as robbing, stealing, and creating blockage. Then both players will be rolling a D6, with the higher value wins. This allows players to feel immersed with the intractable environment.

2.3.3 Players' Interaction with the Game

The game features a military styled map with a chess-like grid pattern. Indicating the locations and paths the player can move to. 3D printed buildings, explosions, and scraps will be scattered throughout the board to block the player's pathways. Players can interact with certain objects that may change the outcome of the game.

Players can interact with different objects on the map, decide which moves to take, and to make actions during each event passively or actively. When making an action, the player will have to roll a dice of D10. Like in a D&D game, with 10 as highly successful, and 1 as completely disaster failure. If the object requires specific skills, interacting with it will start a D10. The action will be assigned with a value with the player must roll an equal for higher to be successful. Players with specific skills that match with the interaction can lower the required value to increase the odds of succeeding. If the action requires multiple players, then both players will roll a D10, with the possible values ranging from 1-20.

2.3.4 Implementation of Robomaster S1

The Robomaster has movement, target aiming, and sound effects. The robot will be located at the center of the map, which scans the surroundings with its sensors.

2.3.4.1 Robot Movement

Moreover, each round, the robot will randomly choose to move location and fire to a location. Firing will cause damage and destruction on objects, streets, and kill players if within blast radius. If the robot sees players within line of sight, the robot will automatically aim towards the player. When it hunts the player and fires a round, a sound will be made to indicate.

2.3.4.2 Sound Design

- Unsettling music will play throughout the game to emphasize the disasters and tragic environment the players will take place in.
- Sound effects will be added in detail to increase the immersiveness and realism of the project. This includes robot movement sounds, people screaming, crying for help, random collapse of streets and buildings, fire burning and electric snapping.

2.4 Primary Idea 4 – Hunted by Steel (Adam Nasimi)

2.4.1 Storyline

Before the game starts players will decide the characters, they are by choosing one character card. This will determine their starting location and nothing else. It is a normal day for the characters of the game when out of nowhere a full-scale invasion of LAWS wipes out most of the residents of the city. Survivors of the attack receive a message that local defenses are outmatched and unable to help so they must find a way to survive on their own. They are advised to reunite with other survivors so that they have the best chance of staying alive. The game is round based where each round is equal to one day. During the rounds players must decide a course of action, whether it is searching for other survivors to partner up with or finding supplies like medicine or provisions. The Robomaster S1 will be patrolling the board, and players can either hide or attempt to distract it, any mistake could cost the player their lives. At the end of the round food and water will be lost and if the player is injured, they could lose the ability to perform certain actions in the future. The more the game progresses the worse it gets for the players until they realize that it was hopeless from the very beginning.

2.4.2 Interaction Between Players

Players can either help each other or try to sabotage the others to have a higher chance of survival. Every action will be tested with a skill check where they will each use a random number generator and whoever has the highest value will win.

2.4.3 Players' Interaction with the Game

The map of the game is a 20'x 20' grid where each tile represents a location. All players and the Robomaster S1 will follow the lines to move to another location. Within each location certain actions will be available for the players to perform. An example is if a player moves on to a supermarket, they can raid it and the amount of supplies gained will be determined with the skill check. Players can try to explore the whole map to survive and to discover why this is happening and who is responsible. However, tiles will not only have locations but could also have NPCs that are friendly or who are desperate and will do anything to survive. For the friendly NPCs players must make a difficult choice of teaming up with them and having more mouths to feed or sacrifice other innocent people to survive. The NPCs who are desperate will attack the players and if based on the skill check they could steal supplies or even kill the players they encountered.

2.4.4 Implementation of Robomaster S1

The Robomaster has movement, target aiming, and sound effects. It will start in a random location and move during each round.

2.4.4.1 Robot Movement

For the first few rounds, the robot will randomly choose to move one tile in any direction. It has a targeting range of four tiles and if the robot sees players within line of sight, the robot will automatically start pathing towards the player. The Robomaster S1 has a firing range of 2 tiles and if it is within range a sound will be played. Within the mid game the robot will start to move 2 tiles and late game it will move 3 tiles.

2.4.4.2 Sound Design

A turret firing sound effect will be played when the robot fires on a player. If the robot spots a player, it will also play an alert sound affect so players know that they are now being hunted.

Global Concept

3.1 Global Concept 1:

3.1.1 Storyline

By combining the stories from "The Extraction" and "The Grand Escape", players will randomly choose a character card that states their identity, skills and weaknesses. The players will then receive the instructions to make it to a different location, where they will meet other players. As a group, the players will escape through the escape points located on the map. At each new location, an event card (refer to 3.1.3.3 Character Cards & Event Cards) will be picked, and the players will have to act to handle the conflict or obstacle. These include moral conflicts (e.g. who to sacrifice when only a handful can enter the escape pathways) and acquiring tools to enter the next location (e.g. acquiring gas to activate the engine of a vehicle). When a player is seen by the LAWS, or unable to make it to the escape points, they are automatically eliminated. In this phase, some players may be eliminated.

The surviving players (ideally two players) will be redirected to the landmark, where they will be extracted from the battlefield. As the rescue squad arrives, the LAWs will have arrived on site. The remaining players will be required to do a dice throw (refer to 3.1.3.2 Gameplay). Regardless of the outcome, the LAWS will eliminate a player on random. This shows that technology has a lack of human judgement and understanding, and sometimes their behavior cannot be explained at all. The surviving player is then extracted to safety.

In the epilogue, it is stated that the players have been branded as criminals, terrorists and rebels, who are responsible for killing thousands. The surviving players are then eventually eliminated by the LAWS activator, as they are the only survivors that are aware of the true nature of LAWS. The LAWS activator does not suffer any consequence for their actions, and with their web of lies, they will never suffer any consequences at all. This demonstrates the lack of accountability of the LAWS.

3.1.2 Interaction Between Players

From "The Grand Escape", players will be allowed to converse with each other verbally with no limitations. However, at each task, players will be required to make decisions. If players intend to act on other players, such as robbing, stealing, and creating blockage. Then both the acting player and the player who will receive the action will be rolling a D6 dice, with the higher value wins.

Figure 2: A D6 Dice

Taken from Microsoft 365 Stock Image Database

3.1.3 Players' Interaction with the Game

3.1.3.1 Environment

From "The Extraction", the experience environment would be based on the design of a Monopoly Board, where different locations in the city would be located at different points within the 20ft x 20ft area. Each location will have a laser-engraved sign to indicate the location.

Players will be starting at Points A, B and C as shown in Figure 1, which will be denoted as specific locations for the characters chosen for the players, e.g. A: school, B: grocery store. They will eventually

make to a rendezvous point at Point D, where they will then move as a group towards the extraction point (Point E) in the final act. The boxes denoted with an asterisk (*) in Figure 3 will be the location of tasks, where they will complete tasks according to the provided event cards.

Across the map, there will also be 3D-printed objects and tools. These may or may not have an impact on the storyline, depending on the instructions of the event card for the task. (refer to 3.1.3.3 Character Cards & Event Cards)

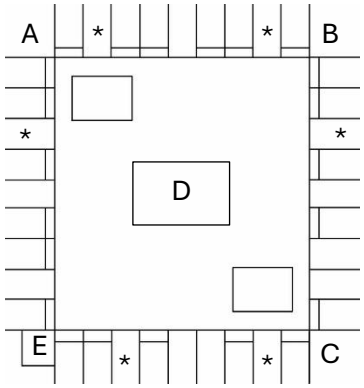

Figure 3: Prototype board of the game environment

Edited from original art by MrShinyBaldy on DeviantArt, based on the Hasbro Game, Monopoly

3.1.3.2 Gameplay

From "The Grand Escape", players can interact with different objects on the map, decide which moves to take, and to make actions during each event passively or actively. There will be three major scenarios:

1) When making an action, the player will have to roll a dice of D10. Like Dungeons & Dragons, 10 implies the action is highly successful, and 1 being complete failure. (e.g. when you decide to sacrifice your move for another player to make it to the next round, throwing a 1 means you will be required to move, while a 10 means the other player is allowed to move)
2) Interacting with a tool that requires specific skill set will start a D10. The action will be assigned with a value with the player must roll an equal for higher to be successful. For example, operating power tools to open an escape route to the next location requires the player to get 7 or above with the D10. Players with specific skills that match with the interaction can lower the required value to increase the odds of succeeding. (e.g. an adult character will have a lower required value than a child character in this case) This will be stated on their respective character cards. (refer to 3.1.3.3 Character Cards & Event Cards)
3) If the action requires multiple players, then two players will roll D10s, with the possible values ranging from 1-20.

3.1.3.3 Character Cards & Event Cards

To enhance the immersive aspect of the experience, players will randomly pick a character card that states their starting positions in the game, skills and weaknesses. This will factor into the gameplay, where specific characters will have a different skill set that may increase their chances of succeeding a task.

Event cards will also be included in the experience, which will be used in each task location. The task goals, background and possible outcome will be printed.

3.1.4 Implementation of Robomaster S1

3.1.4.1 Robot Movement

From "The End Is Near", the Robomaster will start at the back middle of the board, and it will slowly make its way up the board looking for players in its radius in each round. The Robomaster S1 will randomly choose to move location and fire at a location. Firing will cause damage and destruction on objects, streets, and kill players if within blast radius. If the Robomaster detects players within line of sight, the robot will automatically aim towards the player. When it hunts the player and fires a round, a sound will be made to indicate.

3.1.4.2 Sound Design

Unsettling music will play throughout the game to emphasize the disasters and tragic environment the players will take place in.

Sound effects will be added in detail to increase the immersion and realism of the product. This includes robot movement sounds, people screaming, crying for help, random collapse of streets and buildings, fire burning and electric snapping.

For the prologue, general instructions and the epilogue, a game master will be present instead of broadcasting information through the Robomaster. However, the "announcements" will be broadcasted through Robomaster speakers.

Pros	Cons
Very interactive	Robot implementations uncertainty
Immersive	Long set-up time
Action packed	May take longer than 10 minutes
Strong emphasis on ethical concerns	Higher cost

3.2 Global Concept 2:

3.2.1 Storyline

Global Concept 2 is mostly derived from "Hunted by Steel". Please refer to the storyline in 2.4.1.

3.2.2 Interaction Between Players

Players have the option to either cooperate for mutual benefit or undermine one another to improve their own chances of survival. Each action is subject to a skill test, where players will use a random number generator to determine the outcome, with success going to the one who rolls the highest value.

3.2.3 Players' Interaction with the Game

The game map is organized into a 20x20 grid, where each tile represents a distinct location. Players and the Robomaster S1 navigate between these locations by following the grid lines. Each spot on the map offers different actions players can take—such as when a player reaches a supermarket, they can scavenge for supplies, with the outcome determined by a skill check. Players are encouraged to explore the entire map, not only to gather resources but also to uncover the reasons behind the robot invasion and identify those responsible.

Beyond locations, tiles may also feature NPCs who can either be allies or threats. Friendly NPCs present players with tough decisions: they can either team up, increasing their numbers but straining resources, or make harsh sacrifices for survival. On the other hand, hostile NPCs, driven by desperation, may attack, and depending on the skill check, could steal supplies or even kill the players they confront.

3.2.4 Implementation of Robomaster S1

The Robomaster is equipped with movement, targeting capabilities, and sound effects. It begins at a random location and moves each round.

3.2.4.1 Robot Movement

Initially, the robot moves one tile in any direction at random for the first few rounds. With a targeting range of four tiles, it will detect players in its line of sight and automatically pursue them. The Robomaster has a firing range of two tiles, and when it is within this range, a sound cue will play. As the game progresses, its movement increases to two tiles per round in the mid-game and three tiles in the late game.

3.2.4.2 Sound Design

A firing sound effect will trigger when the robot attacks a player, and an alert sound will play if the robot spots a player, signaling that it has begun its pursuit.

Pros	Cons
High stress of being hunted by the robot	Not as immersive as NPCs are left to the imagination
Easy to make it feel like players have lost	Weak story
Simple to program the robot	Not enough to time to not rush through the rounds
Simple rules for players to understand	Difficult to incorporate ethical concerns

3.3 Global Concept 3:

3.3.1 Storyline

Global Concept 3 will be the combination of Global Concept 1 and Global Concept 2, while taking the aspiration of a real world event: the Siege of Sarajevo. The game begins with two distinct groups of players: Survivors and Extractors. The Survivors are scattered across the map, facing dwindling resources, dangerous treats, and the looming presence of other survivors. There goal is to stay alive long enough to be found by the Extractors. Meanwhile, the Extractors are tasked with locating and safely extracting the Survivors from the battlefield.

The games starts off as the Survivors awaken in various locations, forced to make quick decisions about whether to hunker down and hide, scavenge for critical supplies, or attempt to signal for help. However, danger lurks around every corner, robotic autonomous weapons patrolling, traps, and other unpredictability.

On the other side, the Extractors, equipped with tracking tools and communication systems, begin their mission. They must navigate through hostile terrain, avoiding enemy detection, discover any clues left by the Survivors. Time is precious in this game, there will be a very limited window before all survivors die by running out of resources.

Once the Extractors have find all the survivors, they will be able to escape through extraction locations. This can be referenced to the storyline of "The Extraction".

Throughout the entire game section, there will be moral choices, quick and critical thinking. With the center of the game to be: How far would you go to save someone who depends on you?

3.3.2 Interaction Between Players

Combining the two existing Global Concepts, players will instead be two separate groups, one focused on survival, and the other focused on extracting the survivors. The two groups will complete tasks simultaneously and will only be given limited information. For example, the extraction team will only know the general location of the survivors, while the survivors will not know their specific location as well. The two groups can communicate verbally, like actual radio transmissions. However, they will not be allowed to interact physically until they have found each other.

3.3.3 Players' Interaction with the Game

3.3.3.1 Environment

The two groups will move around the limited area, with the survivors' location left ambiguous. A general map will be provided, where the players will have to move physically to evade the LAWS and locate the other team. There will be limited physical tools in the area, with only obstacles for the players to evade the Robomaster.

From "The End Is Near", the way that the player will be able to interact with the game is their movement. As it will be a chess-like board where the player is able to move one tile at a time in any direction any time.

3.3.3.2 Gameplay

Like Global Concept 1, the decision of different steps will be done so with dices. See 3.1.3.2 Gameplay for more details.

3.3.4 Implementation of Robomaster S1

Like "The Extraction" the Robomaster will scout the experience area at a fixed routine. The extraction team will be allowed to determine the scout routine and inform the survivors of their next step.

The speakers of the Robomaster S1 will be used to broadcast the setting, background, and goals to all players. Sound effects will be added in detail to increase the immersion and realism of the product. This includes robot movement sounds, people screaming, crying for help, random collapse of streets and buildings, fire burning and electric snapping.

Pros	Cons
Simple for players of younger ages	Less interactive and immersive
Low cost	Lack of emphasis on ethical concerns
Engaging storyline	Does not fit small groups
All players will have a significant role to play	Robomaster S1 not well-utilized

Chosen Global Concept

The chosen global concept is Global Concept 1: which we dubbed, "The Grand Extraction". The global concept has a high immersive aspect, an intriguing storyline, well-utilization of the Robomaster S1 and most importantly, a strong emphasis on the ethical concerns regarding LAWS. In a group vote, the entirety of Group 8 decided on Global Concept 1, resulting in a unanimous decision.

It should also be noted that while this is the global concept that yielded a unanimous decision, there are still certain cons that rose during discussion. The cons include uncertain implementation of Robomaster S1, time limitations and cost. However, such cons will be further evaluated in following deliverables through testing. Certain aspects in "The Grand Extraction" will be removed and/or replaced with their equivalent in Global Concepts 2 and 3, ensuring the product can meet our requirements and expectations as stated in the previous deliverable.

Conclusion

In conclusion, Deliverable D successfully created and refined Group 8's final conceptual ideas, leading to the collective agreement of "The Grand Extraction." This concept stood out to the group the most due to its immersive experience, amazing storyline, and effective use of the Robomaster S1, while also addressing the ethical concerns around LAWS. Although challenges such as the applications of Robomaster S1, time constraints, and cost were identified, these will be addressed and solved in future phases through testing and problem solving. Adjustments will be made to make sure the final product meets all design requirements and expectations of this project.

Appendix I – Story

Setting:

Somewhere in the near future, set in an urban city. Killer robots (LAWS) have been deployed by an enemy nation to invade the city. The destructive power of the robots has reduced buildings to rubble. LAWs have been programmed to kill any target on sight. You have received the announcement over the radio to get to safety and arrive at the extraction point for a safe escape from this hell hole.

Who are the playable characters:

Character	**Starting Point**
Child	School
Teenager	School
Adult	Grocery store
Profession 1	Workspace 1
Profession 2	Workspace 2
Tourist	Landmark
Middle Age	Coffee Shop
Couple 1	Coffee Shop
Couple 2	Coffee Shop
Elderly	Grocery store

What are the goals:

SURVIVE and escape the LAWS (robot).

Story:

Prologue	Players are provided the *setting*.
Act 1	All players are required to meet up at a place (e.g. police station, underground, embassy) without being terminated by the LAWs.

Act 2	Players must move to extraction while building camaraderie. Events and moral choices will be made during this stage. Some players **may** “die” during this stage.
Act 3	Players arrive at the extraction point. Some players **will** “die” during this stage. Any players who make it to the extraction point will live. Other players will have either been terminated by the LAWs, or equivalent tragic events.
Epilogue	Players suffer the consequences of **every** action. The LAWS handler does not.

Appendix II – Function of Robomaster S1

Function	**Application in our Product**
Chassis speed control	patrol or seeking speeds
Movement of chassis over specific distances	defined directions and movement
Video streaming	recording
Audio streaming	sound effects (getting shot)
Camera	visual sensory; target acquisition
Narrow Infrared Units	night vision (being chased at night); target acquisition in dark locations
Wide Infrared Units	night vision (being chased at night); target acquisition in dark locations
Gimbal Control	360 degree turret targeting