Deliverable D

Conceptual Design

Team F13

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Abstract

Three designs have been conceptualized to begin to idealize how the final virtual reality experience will convey the message to ban Killer Robots. Each scenario has been broken down into subsystems – storyboard, environment, and user interface - to compare their design and functionality. The storyboard of each scenario explains what scenes each scenario will contain and illustrates how they will come together to deliver the final product. The environment subsystem depicts the setting of various scenes within each scenario, and the user interface subsystem explains the various interactive functions in each scenario and explains how the user will receive communication from the experience. Through the conceptual design process, scenario one has been identified as the best option as it involves a very compelling story that will impact the user and invoke an emotional reaction. The first scenario also includes the most interactive functions which will ensure the user stays engaged throughout the virtual reality experience.

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1. Introduction

In Deliverable B: NEEDS IDENTIFICATION, our group formed a problem statement based on the needs and constraints of the client: A need exists for a compelling, interactive, and emotional mobile virtual reality experience to safely and effectively convey the ethical concerns that lethal autonomous weapons raise to decision makers. Our group then benchmarked similar products to make target specifications for our product. Using these specifications, needs, and constraints, our team brainstormed ideas and combined them to finish with 3 final scenarios which are split into 3 subsystems: Environment, Storyboard, and User Interface.

2. Brainstorming

Below are all the ideas that were discussed during our team meeting. They have been combined to develop the 3 scenarios in the next section.

Table 2.1 Includes the results of our teams formal brainstorming and analysis of ideas.

Ideas	Comments
Alex Title - STOP KILLER ROBOTS Subtitle - Make a custom name for the scenario	Easily conveys the intent of the experience to the user and matches the clients name for their campaign. If users were to search the name of the game, they would also find the websites made by the client providing more information on the issue. The subtitle would also help the use to determine what the goal of the scenario is and emphasize the problem that it is trying to address.
Bilal Subsystems: - Aesthetics - Background - Storyboard - Controls	Based on feedback provided by the project manager, the team decided that the subsystems need to be more well-defined. We decided to combine Aesthetics and Background to create the subsystem Environment which includes all the characters, location, and animation. Storyboard is a critical component of the product which will enable us to meet the client's needs. For example, the experience will be brief, emotional, convincing, and demonstrate the ethical concerns of killer robots. Controls was changed to User interface, and it includes the programming of all the interactive elements of the experience.
Remi World/environment: - In an urban environment - Suburbs	The reason why we want an urban environment is because our client mentioned that presently many battles are fought in urban areas, not far away battle fields or deserts.

- Typical North American city - Time: Sunny day, Night, Evening Story - It's your kid's birthday. - You are at work. - autonomous robots are patrolling your neighborhood. - Your family gets attacked by the robots.	We also felt that by using an urban area it would become a more convincing experience for the user as they would more easily imagine themselves in the position of the main character. When someone can imagine themselves in the same position, they are more likely to empathize with the problem. In this scenario we thought that it would be more impactful if the user witnessed how killer robots can not only affect them, but those close to them as well. With this thought in mind, having a child become a victim, when they are doing nothing except enjoying their birthday would create a juxtaposition between happiness and sadness of the event. The team was not sure about the time of day to be used in the scenario to make it more realistic. We felt that if we used a sunny background, it would elicit more feelings of happiness during the birthday party scene and it would also improve the visibility of the scenario because there would not be many shadows. Using an evening background would be more realistic as we start the scenario with the user returning home from work, which is generally during the late afternoon/early evening. However, it would reduce visibility of the scenario and potentially make it less impactful because the user would not be sure of what they are witnessing. It is for this same reason why the team felt that having the scenario at night is neither realistic nor does it improve the impact of the scenario on the user. Another option was for us to combine a sunny afternoon with the early evening. This would give a more realistic feeling as the day would progress throughout the scenario. Tt would add to the impact of the scenario if we timed the darkest time with the moment the robot attacks because the increase in darkness would make the user feel sadder while witnessing the attack.
Kaden World/Environment - In the middle east - Desert - Bright, nice day - Dusty roads	The location was decided with veterans in mind. Many veterans in North America served in Iraq, Afghanistan, and other places in the middle east. As such, we believe seeing the effect killer robots would have in the military would help to convince the upper echelons of the military that it is

- Ruins scattered throughout. Story - User is a soldier station in the Middle East. - Autonomous weapon in your unit - Women approaches from behind holding a baby wrapped in a cloth. - Unit holds fire to assess the situation. - Autonomous weapon follows it's programmed procedure and fires. - Unit approaches the women and unwraps the object in the cloth to see that it's a baby	disadvantageous to use killer robots instead of humans. We decided to make the team composed of mainly human soldiers and only one killer robot because it would allow the user to see how to reaction of humans differs from robots. This would also show the shortcoming of robots as they would lack the ability to analyze the situation themselves, whereas humans are capable of such critical thought. We decided to use a mother and a child because it will help soldiers to relate to any family, they have at home that they are protecting. It would also show users the impact of war and the damage it causes to families.
Tiantian Environment - In front of a convenience store - Typical North American city - Time: sunny day, noon Story - Black guy and user are dressed similarly, are sitting together in a car heading to the convenience store for snacks. - Hears the description of a fugitive, similar description to what the black guy is wearing. - As the user and friend are leaving the store, they bump into a patrol robot - The patrol robot tells you to stop and thinks the black guy is the fugitive that it is looking for. - Black guy reaches for his ID, but the robot thinks he is reaching for a weapon. - Robot tases black guy to apprehend him.	Similar rational for the environment as Scenario 1. The reason we chose a Black person as the victim in this scenario is to highlight how robots can also be racist. We felt that a Black person was the best the highlight this because their struggles with the law, especially in the United States, is a widely discussed and acknowledged problem, and therefore more relatable/understandable for the user.
Alex Buttons/screen - Subtitles for audio - 1 button for volume, 1 to exit the game, 1 for language. - Interactions will be hinted with on screen text bubbles.	Subtitles will be used so that the user can enter the scenario and understand what is going on even without headphones. However, subtitles would decrease the sense of immersion the user would have. We have two language options: English and French. Since the client is a Canadian organization, the experience should be available in both official languages.

	Exit game button in case the user is interrupted and needs to pause or leave the experience. We will hint at interactive items using text bubbles to keep the scenario brief and continuous so that the user does not become lost or confused which would detract from the impact of each scenario.

3. Subsystems

Three main subsystems have been established as a part of this virtual reality experience. Those subsystems are the storyboard, environment, and user interface. The storyboard is the story that will be shown to the user with intent to make them feel connected and change their perspective on autonomous weapons. The environment will be what the user sees and interacts with. Appropriate setting, characters, and weather will be used to make the story come to life and give the user the best experience possible. The final subsystem put in place is the user interface. The user interface contains all the buttons used to start and end the experience as well as the buttons to change settings. Also included in the user interface are text bubbles throughout the experience to give instructions or to show dialog between characters. These three subsystems will collectively create a virtual reality experience that the user can connect and interact with.

3.1. Scenario 1

The first scenario highlights the dangers that self-governing lethal weapons have.

3.1.1. Storyboard

The story starts with the player at an office. It is shown that it is their kid's birthday and that they are waiting to go home. The player is then in their car going home with the radio playing. The news is talking about killer robots and if the public likes them. The player then arrives home where the player is having a water gun fight with their kid. Suddenly, drones fly over and surveil the player. They think the water guns are actual weapons. They sound an alarm and call for backup. Autonomous tanks break into the er is at their yard. The child dies offscreen and we see the body on the floor. In the final scene, the player child's grave with flowers.

3.1.2. Environment

The first environment the player will be in is an office. There will be a computer, desk, and a calendar with the date marked and circled, with text showing it's the kids birthday. There will be keys on the desk that the player will interact with to continue to the next scene.

Figure 3.1.2.1 Office space which appears at the beginning of the experience.

The next scene would be in the car when the player is going home. The player is in the driver's seat, and we can see scenery passing by. The news is playing on the radio, and you can hear the car's engine.

The scene in the yard will take place in the front of the house. We are in suburbs, and it is sunny outside. The child is moving around holding a water gun. The drone will be hovering over the player and the child. The drone will be flashing a red light and lighting up the area. The other robots will show up

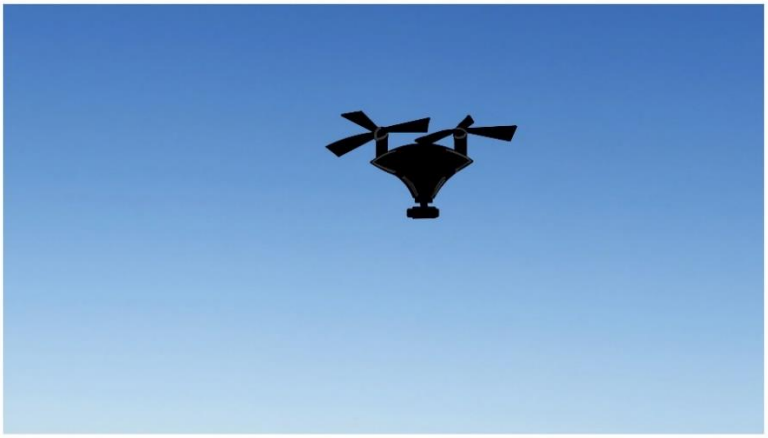
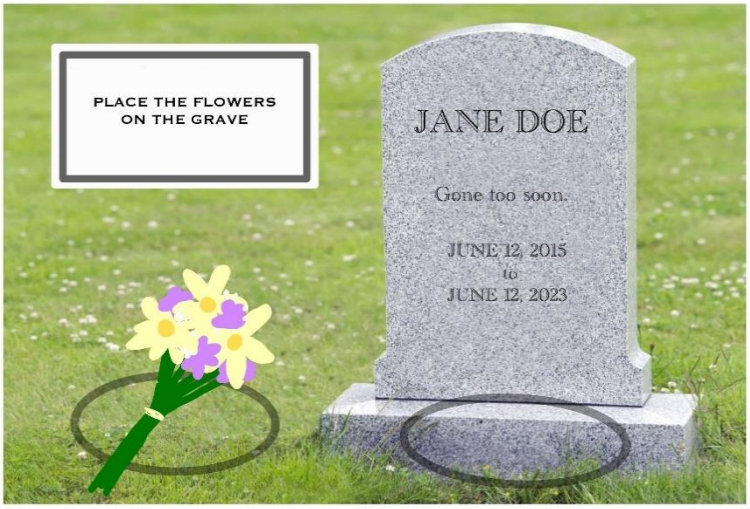


Figure 3.1.2.2 Drone in the sky above the birthday party.

The final scene is in front the player's kid's grave. It will be dull, and the name will be on the gravestone.

Figure 3.1.2.3 child with interactive circled.



Gravestone of elements

3.1.3. User Interface

The user interface will start with a prompt to select your desired language, either English or French before proceeding to the experience. After selecting your desired language, you will be brought to the home screen where you can press the play button to start the experience. Throughout the experience, text boxes will be displayed with either dialog from characters or instructions for the user. The user will have to interact with the environment multiple times in the experience. Interactions include grabbing your keys from your desk at the office, opening your car door, and placing flowers on the child's grave. At the end of the experience, there will be a button to replay the experience and one to end the experience. Finally, a message will be displayed informing you of where to go for more information on autonomous weapons.

Figure 3.1.3.1 Home Screen that will appear when the user opens the experience.

3.2. Scenario 2

The second scenario highlights the shortcomings of killer robots and their lack of critical thinking.

3.2.1. Storyboard

The story starts with the user patrolling the roads of the middle east with their unit. Suddenly, a woman approaches the unit from behind holding an object wrapped in cloth. Standard procedure is to fire, but the soldiers hold to further assess the situation before doing something that can't be undone. The autonomous weapon is programmed to follow procedure, so it doesn't hold fire. The user and their unit approach the women who is now on the ground. The user then interacts with the object and removes the cloth to find it's a baby.

3.2.2. Environment

The environment the user will experience will be in the middle east, in a desert on a hot sunny day. The unit will be patrolling the dusty roads surrounded by ruins with an autonomous weapon by their side.

Figure 3.2.2.1 Mother holding a child in a ruined city.

3.2.3. User interface

The user interface will start with a prompt to select your desired language, either English or French before proceeding to the experience. After selecting your desired language, you will be brought to the home screen where you can press the play button to start the experience. Throughout the experience, text boxes will be displayed with either dialog from characters or instructions for the user. The user will have to interact in this experience to remove the cloth from the unknown object before seeing that it's a baby. At the end of the experience, there will be a button to replay the experience and one to end the experience. Finally, a message will be displayed informing you of where to go for more information on autonomous weapons.

3.3. Scenario 3

The third scenario highlights how the use of killer robots in crime prevention will result in greater racial divide and more racism.

3.3.1. Storyboard

The story starts with the player in front of a convenience store, he will see a black people sketching into his coat to grab something. Then the patrolling robots thinks the black people is grabbing a pistol, so it shoots him. The player come close to check and find out that the black people was trying to grab his wallet to check out.

3.3.2. Environment

The story happens at night. In front of a convenience store in a quiet street, and there is killing robots patrolling around the street.

Figure 3.3.2.1 Victim in front of convenience store before being confronted by killer robot.

3.3.3. User Interface

The user interface will start with a prompt to select your desired language, either English or French before proceeding to the experience. After selecting your desired language, you will be brought to the home screen where you can press the play button to start the experience. Throughout the experience, text boxes will be displayed with either dialog from characters or instructions for the user. The user will have to interact with the door of the convenience store to open it as well as interacting with picking out a snack in the store. At the end of the experience, there will be a button to replay the experience and one to end the experience. Finally, a message will be displayed informing you of where to go for more information on autonomous weapons.

4. Concept Analysis

The table below is the decision matrix that compares the concept designs to each other based on our outline design criteria that were determined in Deliverable C: DESIGN CRITERIA.

1 = Red (Low) 2 = Yellow (Average) 3 = Green (High)

Table 4.1 Concept Analysis and Criteria Specifications.

Design Criteria	Importance Factor	Scenario 1	Scenario 2	Scenario 3
Maximum Area (m^2)	4	2	8	83
Compatible Devices	5	HTC Vive	HTC Vive	HTC Vive
File Size	5	N/A	N/A	N/A
Single Player	3	Yes	Yes	Yes
Maximum time (min)	3	~8	~5	~5
Appropriate for teenagers	4	Yes	No	No
Convincing to user	5	Yes	Yes	No
Fictional Characters	4	Yes	Yes	Yes
User needs to move	1	No	No	No
Unique Story	3	Yes	Moderate	No
Inclusive	5	Yes	Yes	No
User can Empathize	5	Yes – All	Only Veterans	Yes
Viewing Medium	5	VR	VR	VR
Few Controls	4	3	3	3
Languages	4	EN/FR	EN/FR	EN/FR
Total	N/A	156	143	125

5. Conclusion

Our group has decided that Scenario 1 is our best concept and wish to pursue refining it using the client's feedback during Client Meeting 2. We feel that it has the most potential for interactivity, emotions and conveying the message. Compared to the other scenarios, Scenario 1 presents more opportunities for interactive elements without degrading the quality of the story. Whereas in the other scenarios, by adding interactive elements we would distract the user from the main concern: killer robots and their actions. We also feel that Scenario 1 is more emotional as it is a scenario that the majority of people can relate to. This would help spread the message and bring the issue to the forefront of public discussion. The main concern with this scenario is that it might be too long and that we would have to cut down on the content of the scenario to meet the constraint of <5min. Our next objective is to make a cost estimate of our project.