Deliverable D

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Trello Board: https://trello.com/b/p8ZWMdHe/gng1103-project

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3 Introduction

The purpose of this document is to show the team's initial concepts to our game with the Robomaster S1. It compares the individual solutions by each team member with the design criteria and the solutions of the other team members to create one ideal first group concept for each subsystem, as well as the full system. This document describes the team's first thoughts on how the game will function, as well as our plans for the future.

4 The Game

Our task was to create an interactive game between the Robomaster S1 and the public that, that leaves the people who played the game feeling like they have lost and help them to understand why lethal autonomous weapon systems (LAWS) should be preemptively banned. The game our team decided to go with is a version of red light – green light, in which the players goal will be to make it across the room without being "shot" by the Robomaster. Further details on how the "winner" will be decided, as well as

rules and player floor layout will be decided in this document by comparing multiple concepts to each other and our design criteria.

5 Subsystems

Subsystem 1: Player Targeting

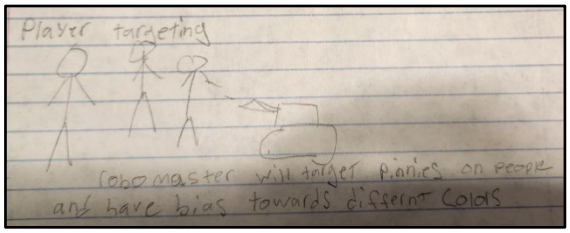

Figure 1 - Sam Hrycenko Subsystem 1

Lucas: The Robomaster [*Figure 1*] will target red or green with a bias that will change based on the round of the game. This will show an algorithmic bias and an inability to explain what went wrong. The Robomaster targeting perimeters will also change depending on how close players are from the goal.

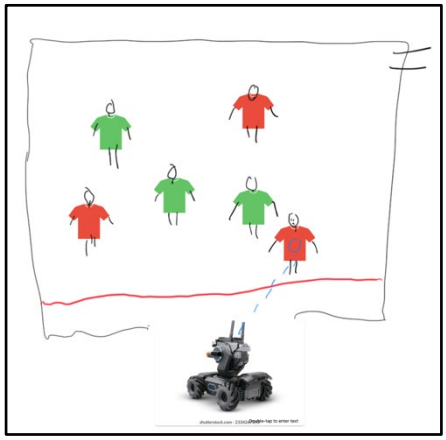

Figure 2 - Lucas Schuyler Subsystem 1

Sam: [*Figure* 1] Players will be provided with different colored pinnies and the robomaster will hold biases against certain colours ie. The threshold to fire on red pinnies will be far greater than those in green pinnies. This bias can change round to round and will help demonstrate the biases a LAWS system could have as well as confuse the players, making it difficult to decipher the robomaster intentions

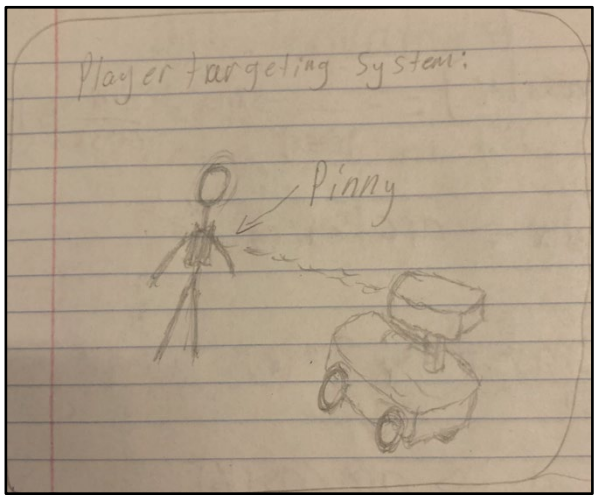

Figure 3 - Jacob Pavone Subsystem 1

Jacob: The Robomaster [Figure 3] will target players based on the colour of the pinny they have been given and are wearing. This can help the participants differentiate what type of character they are while allowing for the LAWS to display the concern of systematic bias. The pinny will be detected by a sensor on the Robomaster, and it will then fire depending on the colour of the pinny and based on how much the LAWS has lost control of itself. In the end, the winner will be the one who gets the furthest without being "shot" by the robot. The robot can be disoriented by having multiple players with similar pinny colours being in the same area.

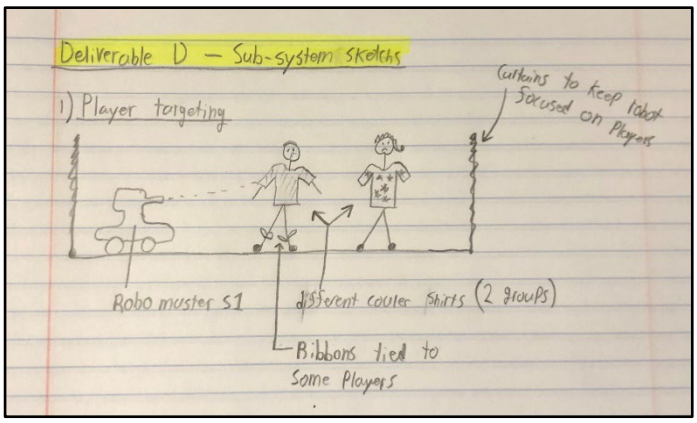

Figure 4 - Owen Tyman Subsystem 1

Owen: The Robomaster [*Figure 4*] will look for certain colours given to the players to put on, such as pinnies or bandanas tied around legs, etc. Based on the light indications, it will fire lasers at certain colours to eliminate them. Curtains are placed around the edge to prevent distractions. All players will be eliminated before reaching the end, with the winner being the one who gets the furthest.

Subsystem 2: Game Procedure Indication

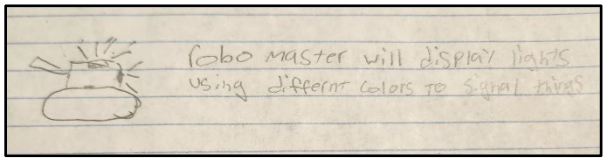

Figure 5 - Sam Hrycenko Subsystem 2

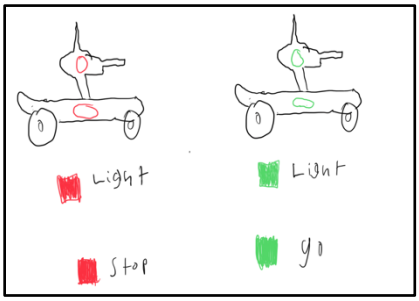

Figure 6 - Lucas Schuyler Subsystem 2

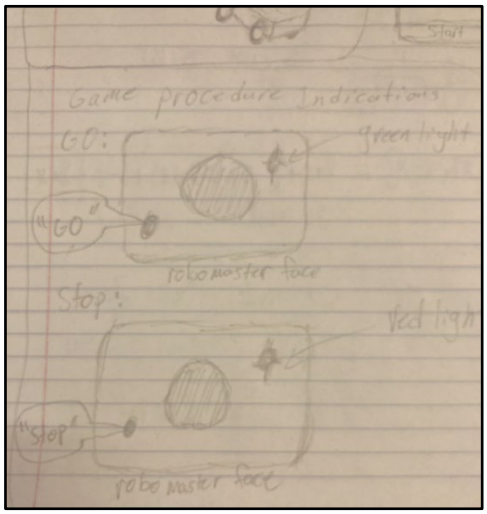

Figure 7 - Jacob Pavone Subsystem 2

Lucas: [*figure 5*] The LED lights on the Robomaster will indicate to the players whether to stop or go during the game, red means stop, green means go.

Sam: [*Figure 6*] using the available LEDs, robomaster will display different colors to instruct players on what to do. Ex. Green means go, red means stop.

Jacob: [*Figure 7*] The Robomaster will use a combination of led lights and sounds to indicate to the player when they can move and when they should be still. The speaker will play a “GO” and show a green light when the players are free to move and a “STOP” sound, paired with a red light when the players should be still. This can help show the concern of lack of accountability, and loss of meaningful human control, as the robot can still eliminate players, even when they say it is safe to move. This also allows for greater accessibility to the experience, as people with eyesight problems can still play with the sound, and vice versa for those with hearing problems.

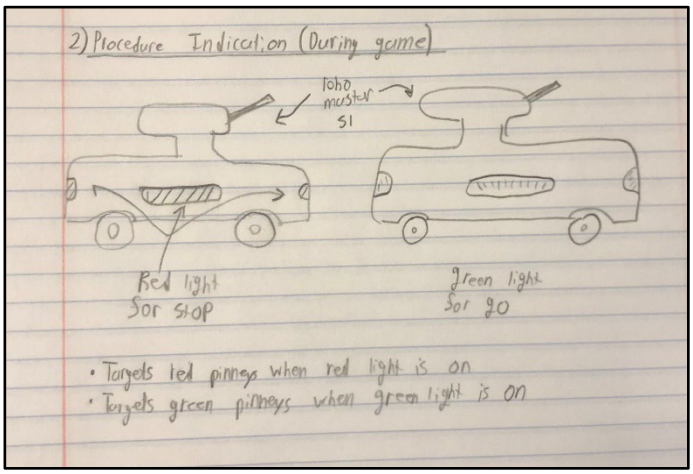

Figure 8 - Owen Tyman Subsystem 2

Owen: Players [*Figure 8*] will be instructed to walk on green, and stop on red. Robomaster will target red players if moving on red, but green players if moving on green. Rule will switch if a player reaches the halfway point. Will target players closer to the finish more intensely.

Subsystem 3: Playing Area

Sam: [Figure 9] Players will try to get from one end of the area to the other (approx. 10ft) while avoiding obstacles. Perimeter will be set up using rope and stakes for clear visual boundaries.

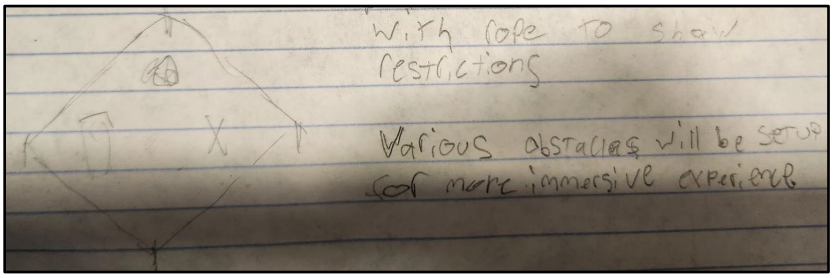

Figure 9 – Sam Hrycenko Subsystem 3

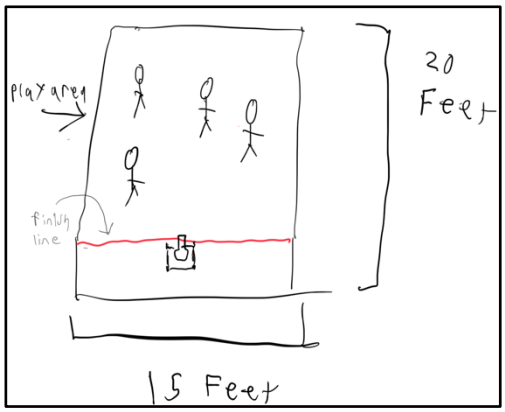

Figure 10 - Lucas Schuyler Subsystem 3

Lucas: [*figure 10*] shows the play area that is around 20 feet long and 15 feet wide that way there is enough space for the games to not be too fast and so that the robomaster will have an easier time targeting players because they wont overlap with each other much.

Jacob: [*Figure 11*] players will move towards the robot, across the playing area, without getting eliminated. There will be obstacles in the playing area, that can either make it more difficult to get to the robot or can be a safe space for players, depending on the way they play the game. This will make it a more lifelike experience, as many places will have obstacles within their domain, and a blank plane may make the game seem more basic.

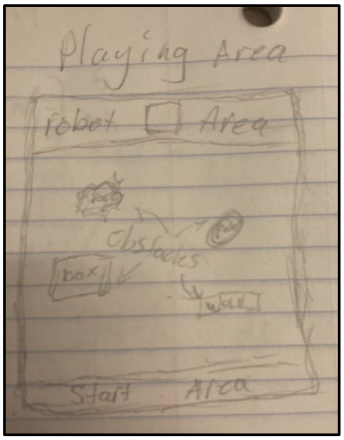

Figure 11 – Jacob Pavone Subsystem 3

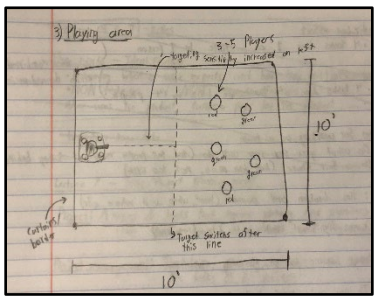

Figure 12 – Owen Tyman Subsystem 3

Owen: The bottom half of the playing area [Figure 12] will be normal rules as stated above. Once crossing the halfway line (Ribbon), the robot will switch rules. Robot is stationary at the top of the game. Right side of second half is targeted more intensely than left side o add confusion. Curtain is around playing area to block other lights and colours.

Subsystem Analysis

Colour code	N/A in for the subsystem	Does not meet criteria	Somewhat meets criteria	Meets and/or exceeds criteria
Design Criteria	**Lucas**	**Sam**	**Jacob**	**Owen**
Multiplayer (3-5 players)				
Difficult system to figure out (Intricate)				
Young adult target audience				
Easy set up				
Fits in suitcase (55x35x22cm)				
Not affected by surroundings				
Participants feel like they lost				
Trigger warnings				

No religious/cultural/location biases				
Lack of human behavior				
3/9 ethical concerns				

Table 4 – Player Targeting Analysis

Colour code	**N/A in for the subsystem**	**Does not meet criteria**	**Somewhat meets criteria**	**Meets and/or exceeds criteria**
Design Criteria	**Lucas**	**Sam**	**Jacob**	**Owen**
Multiplayer (3-5 players)				
Difficult system to figure out (Intricate)				
Young adult target audience				
Easy set up				
Fits in suitcase (55x35x22cm)				
Not affected by surroundings				
Participants feel like they lost				
Trigger warnings				
No religious/cultural/location biases				
Lack of human behavior				
3/9 ethical concerns				

Table 5 – Game Procedure Indicators Analysis

Colour code	**Not applicable for the subsystem**	**Does not meet criteria**	**Somewhat meets criteria**	**Meets and/or exceeds criteria**
Design Criteria	**Lucas**	**Sam**	**Jacob**	**Owen**
Multiplayer (3-5 players)				
Difficult system to figure out (Intricate)				
Young adult target audience				
Easy set up				
Fits in suitcase (55x35x22cm)				
Not affected by surroundings				
Participants feel like they lost				
Trigger warnings				
No religious/cultural/location biases				
Lack of human behavior				
3/9 ethical concerns				
Game lasts < 10 mins				

Table 6 – Playing Are

6 Full System

After analysing the tables, we were able to come up with a description for each subsystem, that we were able to transfer into a drawing of the entire system [*Figure 13*]. For subsystem 1, we will have five players divided into two groups, one of three and one of two. The group of three will receive red pinnies and the group of two will receive green pinnies. Additionally, one member of each team will receive a bandana to tie around their ankle. The robomaster will the search for certain colours and "fire" upon then (reasons identified in subsystem 2) to eliminate the player from the game. The winner is the player who makes it the closest to the end. Players closer to the end will be shot at a higher priority.

In subsystem two, players will be told to play a simple game of red-light green light, and the robot will switch between saying go, and turning its green lights on, to saying stop, and turning its red lights on. However, it will only target the group that corresponds to the colour of the LEDs. This rule will change depending on their position on the board (defined in subsystem 3).

In subsystem 3, we have a 10 foot by 10 foot playing area outlined by ribbon, with robot on one end and the players on the other. There will be a few obstacles on the ground and the floor will be divided into three sections by ribbon. In the bottom half, the robot will target the group that corresponds to the colour of the LEDs. When they cross the middle line, it will switch. If they cross on the right side, they will be targeted at all times. The robot will randomly move and do weird stuff.

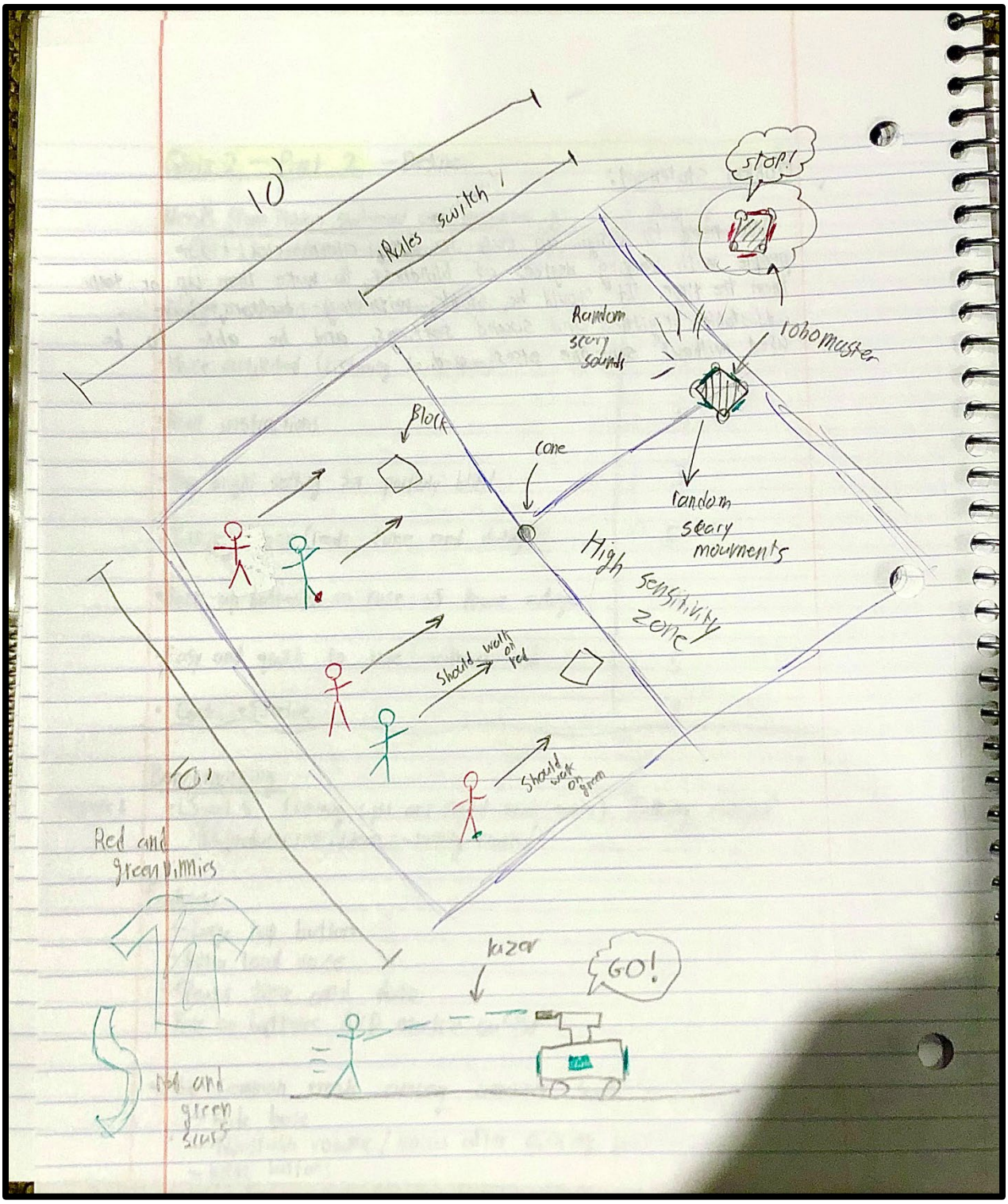

Figure 13 – Full System Sketch

7 Conclusions and Recommendations

In conclusion, our designs came together to form a complete, skeletal form of our experience. We condensed our three subsystems of player targeting, game procedure, and playing area into a series of

design requirement checks and decided on the aspects of each person's subsystem prototypes to include in the final concept. We decided on a targeting system utilizing pinnies of different colours to help the robot and players differentiate between different types of characters. We decided on a combined sound-led system to indicate when to move and when to stop while playing. Finally, we decided on a 10’ by 10’ playing area, with ribbon borders and small obstacles scattered around to aid in the participants' endeavour to get to the robot without being eliminated.

8 Future Work

Our new challenges come with the prospect of coding all these aspects into the robot's programming and making each aspect as effective and important as possible to the experience. However, what is a more pressing challenge is the way to have the robot perform random acts that display ethical concerns, as well as creating a challenging yet obvious way to have the players beat the robot by discombobulating it.

9 Consulted resources

DUST. (2019). *Slaughterbots*. *Sci-Fi Short Film “Slaughterbots”* |Retrieved from https://www.youtube.com/watch?v=O-2tpwW0kmU .

Michael C. Horowitz; The Ethics & Morality of Robotic Warfare: Assessing the Debate over Autonomous Weapons. *Daedalus* 2016; 145 (4): 25–36. doi: https://doi.org/10.1162/DAED_a_00409

“Slaughterbots” https://www.youtube.com/watch?v=O-2tpwW0kmU

The Ethics and Morality of Robotic Warfare Project: https://direct.mit.edu/daed/article/145/4/25/27111/The-Ethics-amp-Morality-of-Robotic-Warfare