Project Schedule and Cost

Team 2

Samuel Durocher, Ethan Harvey,
Mason Timotej, Linh Nguyen, Charles Tanagho

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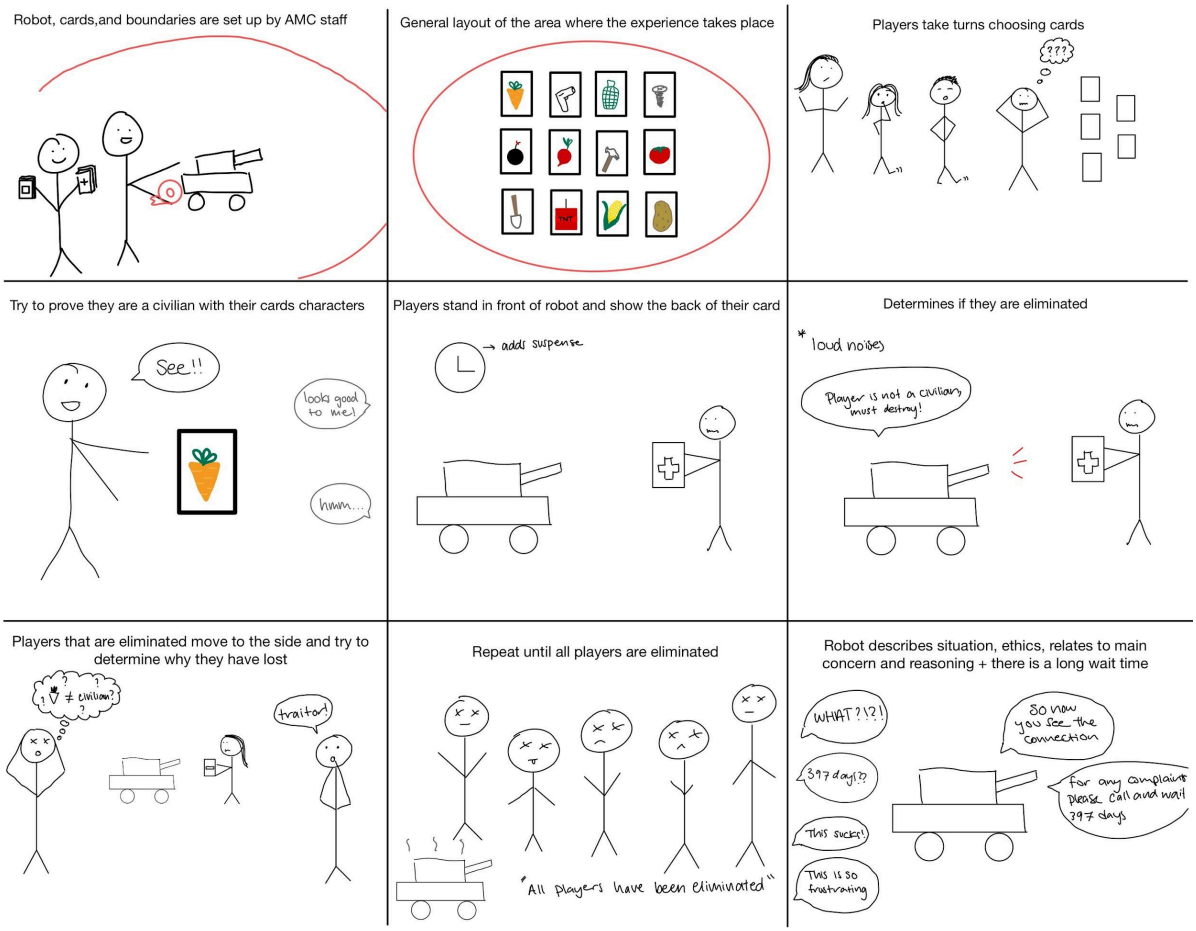
1. Introduction

The intent of this project is the development of a functional prototype based on certain client interests, the application of engineering design principles and methodologies. We follow a structured process which includes analogue concept designs, detailed drawings, task scheduling, risk management, material sourcing and extensive, structured testing of prototype iterations. This deliverable details what phases we have gone through in our project, from the initial design idea phase, to risk contingency planning, to task assignments and schedules in order to meet our deadlines on time. By documenting and testing, we hope to have a high quality final prototype, which satisfies both the functional and design requirements, and illustrates the degree to which engineering concepts are used.

2. Concept Design & Detailed Drawings

2.1. Project Concept Specific Storyboard:



2.2. Explanation of Concept/Feedback

Concept 3 from deliverable D chosen, with additional components:

- Cards have more human symbols on the back, to increase user thinking
- Robot movement is more restricted, due to client concerns of accuracy
- No survivors may exist at the end of the game, due to client-shared concern of users feeling they are a “winner”.
- Number of eliminations should vary more each round, to reduce predictability of the robot.

2.3. Visual processing.

Robots may not be able to well distinguish the position of visual objects (binary identified/ not identified). This would require shifting of the game to prevent multiple users being in frame at the same time.

2.4. Main game loop.

The DJI education hub may not have good support for multiple users, and saves tend to be unstable. A good method of transferring code and working collaboratively will need to be developed.

2.5. Movement function.

Robot position is only known by recording displacement. If displacement measurements prove to be too inaccurate, the robots movement during the game will need to be reduced.

3. Task Schedule & Responsibilities & Risk Management & Contingency Plans

3.1 Prototype 1 (October 27 - November 3)

Task ID	*Task Description*	*Duration*	*Due date*	*Owner*	*Dependencies*	*Risks*	*Contingency plan*
1	Discuss results with the team. Propose potential improvements for the next prototype. Record all ideas. Decide if the concept will be further developed or if other concepts should be pursued.	2 Hours	02-Nov	Charles - Quality Control	11	Potential for conflict when deciding if other concepts should be pursued. Potential for a large amount of added work if the concept is changed.	If conflict arises, voting will take place to determine the team's decision. Both sides to be recorded in case of revisiting. Project manager to create a plan to complete new work if the concept is changed.
2	Edit, refine and finalize the report.	1 Hour	02-Nov	Charles - Quality Control	7		
3	Keep the group on the correct path by referencing lecture material. Each step to be checked before moving forward.	2 Hours	03-Nov	Charles - Quality Control			

4	Record data of all defined objectives for prototype 1.	30 Minutes	01-Nov	Ethan - Report Writer	11		
5	Record all steps taken in prototype development	1 Hour	03-Nov	Ethan - Report Writer			
6	Create a report template.	30 Minutes	31-Oct	Ethan - Report Writer			
7	Format and fill report template.	1 Hour	02-Nov	Ethan - Report Writer	6		
8	Format each provided document throughout the process.	1 Hour	02-Nov	Ethan - Report Writer			
9	Create a testing environment. Have a list of needed test data ready.	1 hour	30-Oct	Linh - Engineer	15		
10	Complete purchase process for needed supplies.	30 minutes	30-Oct	Linh - Engineer	15	Potential for delay.	Group contribution to buy any needed items within reason.
11	Run tests on prototype 1.	1 Hour	01-Nov	Linh - Engineer	14		
12	Analyze data from tests.	1 hour	02-Nov	Linh - Engineer	11	Potential for negative results.	Project manager to create a plan to complete the changed concept.
13	Draft rough map of code for prototype 1. Include needed functions and steps. Record ideas for potential alternative routes.	1 Hour	29-Oct	Sam - Designer	15		
14	Write complete code for prototype 1. Record all issues experienced. Record any changes made to the concept.	3 Hours	31-Oct	Sam - Designer	13	Potential for concept change. Code may be too complex.	Project manager to create a plan to complete the changed concept.
15	Complete outline of prototype 1 test plan. Discuss with the group.	3 Hours	27-Oct	Tim - Project Manager			
16	Keep track of team progress. Update plan if needed. Ensure group members are completing assigned tasks.	1 Hour	03-Nov	Tim - Project Manager		Potential for delayed work from members.	Member to be contacted to determine reasoning. If valid, redistribution of workload to be determined by the project manager.

3.2. Prototype 2 (November 3 - November 10)

Task ID	Task Description	Duration	Due date	Owner	Dependencies	Risks	Contingency plan
1	Draft rough outline for prototype 2 with completed adjustments.	3 Hours	05-Nov	Charles - Designer	6		
2	Complete prototype 2.Record all issues experienced. Record any needed changes.	3 Hours	07-Nov	Charles - Designer	1	Potential for concept change. Concept may be too complex.	Project manager to create a plan to complete the changed concept.
3	Discuss results with the team. Propose potential improvements for the next prototype. Record all ideas. Decide if the concept will be further developed or if other concepts should be pursued.	2 Hours	09-Nov	Ethan - Quality Control	13	Potential for conflict when deciding if other concepts should be pursued. Potential for a large amount of added work if the concept is changed.	If conflict arises, voting will take place to determine the team's decision. Both sides to be recorded in case of revisiting. Project manager to create a plan to complete new work if the concept is changed.
4	Edit, refine and finalize the report.	1 Hour	09-Nov	Ethan - Quality Control	17		
5	Keep the group on the correct path by referencing lecture material. Each step to be checked before moving forward.	2 Hours	10-Nov	Ethan - Quality Control		Potential for delayed work from members.	Member to be contacted to determine reasoning. If valid, redistribution of workload to be determined by the project manager.
6	Complete outline of prototype 2 test plan. Discuss with the group.	3 Hours	03-Nov	Linh - Project Manager			
7	Discuss concept changes and improvements determined from prototype 1.	1 Hour	03-Nov	Linh - Project Manager			
8	Keep track of team progress. Update plan if needed. Ensure group members are completing assigned tasks.	1 Hour	10-Nov	Linh - Project Manager			
9	Discuss any task adjustments with updated assignments.	30 Minutes	10-Nov	Linh - Project Manager			
10	Create a testing environment. Have a list of needed test data ready.	1 hour	06-Nov	Sam - Engineer	6		
11	Complete purchase process for needed supplies.	30 minutes	06-Nov	Sam - Engineer	6	Potential for delay.	Group contribution to buy any needed items within reason.
12	Run tests on prototype 2.	1 Hour	08-Nov	Sam - Engineer	2		

13	Analyze data from tests.	1 hour	09-Nov	Sam - Engineer	12	Potential for negative results.	Project manager to create a plan to complete the changed concept.
14	Record data of all defined objectives for prototype 2.	30 Minutes	08-Nov	Tim - Report Writer	12		
15	Record all steps taken in prototype development	1 Hour	10-Nov	Tim - Report Writer			
16	Create a report template.	30 Minutes	07-Nov	Tim - Report Writer			
17	Format and fill report template.	1 Hour	09-Nov	Tim - Report Writer	16		
18	Format each provided document throughout the process.	1 Hour	09-Nov	Tim - Report Writer			

3.3. Prototype 3 (November 10 - November 17)

Task ID	*Task Description*	*Duration*	*Due date*	*Owner*	*Dependencies*	*Risks*	*Contingency plan*
1	Draft rough outline for prototype 3 with completed adjustments.	3 Hours	12-Nov	Ethan - Designer	6		
2	Complete prototype 3.Record all issues experienced. Record any needed changes.	3 Hours	14-Nov	Ethan - Designer	1	Potential for concept change. Concept may be too complex.	Project manager to create a plan to complete the changed concept.
3	Discuss results with the team. Propose potential improvements for the final product. Record all ideas. Decide if the concept will be further developed or if other concepts should be pursued.	2 Hours	16-Nov	Tim - Quality Control	13	Potential for conflict when deciding if other concepts should be pursued. Potential for a large amount of added work if the concept is changed.	If conflict arises, voting will take place to determine the team's decision. Both sides to be recorded in case of revisiting. Project manager to create a plan to complete new work if the concept is changed.
4	Edit, refine and finalize the report.	1 Hour	16-Nov	Tim - Quality Control	17		
5	Keep the group on the correct path by referencing lecture material. Each step to be checked before moving forward.	2 Hours	17-Nov	Tim - Quality Control		Potential for delayed work from members.	Member to be contacted to determine reasoning. If valid, redistribution of workload to be determined by the project manager.

6	Complete outline of prototype 3 test plan. Discuss with the group.	3 Hours	10-Nov	Sam - Project Manager			
7	Discuss concept changes and improvements determined from prototype 2.	1 Hour	10-Nov	Sam - Project Manager			
8	Keep track of team progress. Update plan if needed. Ensure group members are completing assigned tasks.	1 Hour	17-Nov	Sam - Project Manager			
9	Discuss any task adjustments with updated assignments.	30 Minutes	17-Nov	Sam - Project Manager			
10	Create a testing environment. Have a list of needed test data ready.	1 hour	13-Nov	Charles - Engineer	6		
11	Complete purchase process for needed supplies.	30 minutes	13-Nov	Charles - Engineer	6	Potential for delay.	Group contribution to buy any needed items within reason.
12	Run tests on prototype 3.	1 Hour	15-Nov	Charles - Engineer	2		
13	Analyze data from tests.	1 hour	16-Nov	Charles - Engineer	12	Potential for negative results.	Project manager to create a plan to complete the changed concept.
14	Record data of all defined objectives for prototype 3.	30 Minutes	15-Nov	Linh - Report Writer	12		
15	Record all steps taken in prototype development	1 Hour	17-Nov	Linh - Report Writer			
16	Create a report template.	30 Minutes	14-Nov	Linh - Report Writer			
17	Format and fill report template.	1 Hour	16-Nov	Linh - Report Writer	16		
18	Format each provided document throughout the process.	1 Hour	16-Nov	Linh - Report Writer			

4. Bill of Materials (BOM) & Equipment List & Prototype Testing Plan

Week	Prototype	Materials	Procedure	Stop condition	Cost
1	Pseudo code	Google docs	Create a high level plan for robot game loop, game control.	All members are satisfied with the pseudocode level of specificity, clarity.	No cost
1	Visual processing function	DJI Education Hub, robot	Code function to parse visual information in DJI education hub, upload to real or virtual robot. Observe robot's response to stimuli by coding in temporary indicators (eg. green means face/card identified).	Robot successfully identifies face, symbol cards. Robot successfully associates nearby faces and cards. Robot recognize the center card/face?	No cost
2	Main game loop	Google docs, DJI Education Hub	Code skeleton main game loop, with function calls but no function declarations.	All members are satisfied with the game loop comprehensivity.	No cost
2	Movement function	DJI Education Hub, robot	Code function to track and initiate robot movement in DJI education hub, upload to real or virtual robot. Observe the robot's accuracy of movement. Measurements should be centimeter accurate.	Several rounds of robot movement have been observed. Accuracy data obtained for >10 varied measurements.	No cost
3	Comprehensive	DJI Education Hub, robot	Comprehensive prototype developed.	Robot successfully plays the entire game outlined in design steps.	10-20$ for cards and tape

Week	Prototype	Objective	Approach	Input to development
1	Pseudo code	Proof of concept	Analytical	Determination of the game loop procedure.
1	Visual processing function	Subsystem validation	experimental	Validation of the visual processing ability. Limitations in differentiating visual objects may lead to an adjustment of the game towards players presenting themselves to the robot.
2	Main game loop	Subsystem validation	Analytical	Validation of the game loop procedure. Software limitations may necessitate adjusting the game loop structure. Limitations in movement accuracy may lead to an adjustment of the game towards players presenting themselves to the robot.
2	Movement function	Subsystem validation	experimental	Validation of the accuracy of robot movement.
3	Comprehensive	final design functionality	experimental	Comprehensive prototype used to identify errors ahead of release.

5. Conclusion

This deliverable represents our team's engineering approach from conceptual design to prototype testing. The documentation traces each phase: design, planning, risk assessment, and testing that the prototype should meet the defined goals and take care of the client requirements. The project has remained on track despite the task schedule and assigned responsibilities to each team member, and because of the risk management and contingency strategies, unexpected challenges can be handled. However, our method of iterative prototype testing enables us to refine and improve the design at every stage. To this end, our prototype is underway, modeled by ourselves to communicatively find faults in the product early; we are committed to continuous improvement, using each phase to improve functionality, reliability, and user experience for the final product. Looking back, we believe this has been a great chance to apply the engineering principles and teamwork skills we have learned in practice, this will become an asset in the future engineering career.

6. References:

RoboMaster S1 - DJI. DJI Official. https://www.dji.com/ca/robomaster-s1 (Accessed 2024-10-11)