Project deliverable F: Prototype I and Customer feedback

1. Client Feedback and Implementation

- **Feedback Received:**
    - The arm design needs more refining.
    - How the arm will hold the marker needs to be finalized.
    - A possible implementation would be to use magnetic clamps.
    - A possible implementation would be to 3D print a “ring” clamp and use screws to fit the clamp around the marker.
    - Research the blueprint for the Robomaster S1, to find measurements for 3D printing.
    - In terms of cosmetics, use hot glue (a small amount) to secure the wig to the Robomaster.
    - In the BOM, include more specific prices, such as the cost of a single piece of A4 paper, or the cost of 2 small magnets.
- **How Feedback Informs Future Design Choices:**
    - The team will refine the arm design to improve stability and functionality
    - Different marker-holding mechanisms will be tested, such as a magnetic clamps design, as well as a 3D-printed clamp that uses bolts and nuts, to determine the most effective solution.
    - The team will obtain the blueprint for the Robomaster S1, to ensure accurate measurements for 3D – printed parts.
    - Cosmetic elements will be tested for durability, functionality, and overall aesthetics.
    - The BOM will be updated with a more detailed cost breakdown to improve budget accuracy.

2. Prototype Development

- **Objective of Prototype:**
    - The objective of Prototype I is to determine if the RoboMaster S1 can effectively draw by taping a marker to a stick and attaching it to the turret arm.
- **Prototype Scope:**
    - Basic proof of concept to determine if the Robomaster S1 can control a markers movement effectively.

- **Materials Used:**
    - Marker (Sharpie)
    - Painters Stir stick
    - Duct tape
    - Robomaster S1
- **Prototype Construction:**
    - The marker will be fastened to the stir stick using duct tape. Said stir stick will be attached to the Robomaster turret arm, using duct tape

3. Analysis of Critical Components or Systems

- **Key Components and Their Function:**
    - [Identify the critical components of the prototype]
- **Engineering Considerations:**
    - [Discuss any calculations, assumptions, or technical considerations]

4. Prototyping Test Plan

- **Objective of Testing:**
    - Determine if the Robomaster S1 can be used to effectively control a markers movement to produce a legible drawing, in this case, a “Peace” symbol
- **Testing Procedure:**
    - Attach marker to stir stick using tape
    - Attach stir stick to turret arm using tape
    - Write a basic program for the Robomaster, so that it draws a peace symbol
- **Metrics for Success:**
    - The Robomaster can create distinguishable lines and circular shape.
- **Stopping Criteria:**
    - If all pieces of the protoype remain stable, and the peace symbol is adequately drawn, the testing can be concluded.

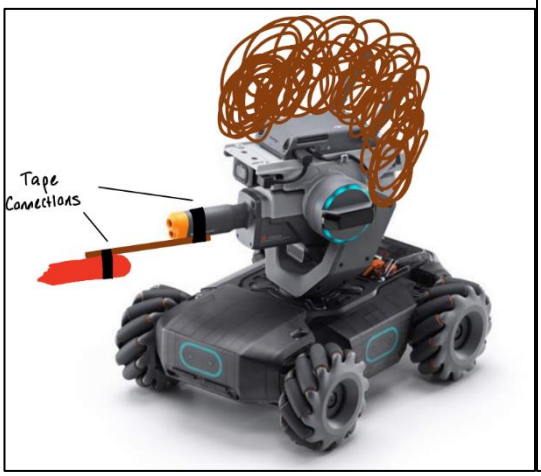
5. Client/User Feedback on Prototype

- **Potential Clients/Users Identified:**
  - Clients provided insights on feasibility and ethical messaging
  - Team members collaborated on design choices and feasibility of prototypes
  - The clients/project evaluators confirmed that 3D printing an attachment is feasible

- **Feedback Received:**
  - The turret has a 200-degree range of motion, can hold a moderate amount of weight, and is not removable. This means any attachments must work within these limits.
  - Suggested magnetic clamps or 3D-printed ring clamps with screws. The final method needs testing for stability and ease of removal.
  - Cosmetic modifications like a wig are acceptable, if they don't interfere with function of the prototype.
  - Hot glue is a possible option for securing non-permanent elements like the marker.
  - The Rootmaster is coded in scratch/python.
  - Team can use maker space to print the 3D attachment.
  - The team should obtain RoboMaster S1 blueprints for precise measurements.
  - The BOM needs more detailed pricing, including small components like A4 paper and magnets.
- **Impact on Design and Target Specifications:**
  - The arm design will be created simply and ensure stability.
  - The motion constraints of the RoboMaster do not allow for full 360-degree rotation, so the code will need to be adjusted to use a more complex movement pattern instead of a simple spin.

6. Updates to Detailed Design and BOM

- **Updated Design Changes:**



Prototype 1 Design **Possible final detailed design**

- The above images show the updated designs for prototype 1 and the final design considering the feedback and results the team has received thus far.
- The revised detailed design takes into consideration the received feedback and testing results by implementing a more robust clamp system using screws or magnets to hold the marker rather than press fitting the attachment to the RoboMaster.
- The design for prototype 1 remained almost entirely the same, but now only uses tape to adhere to the updated bill of materials listed below.

Bill of Materials (BOM) Update:

Item	Cost ($)
Paint stir stick	0
A4 paper (4 pieces)	0.02
Sharpie fine point marker	0.9
Robo master S1	0
Cosmetics (Wig)	15
Robomaster app	0
Duct tape (“Gorilla tape”)	5
Super glue (“Krazy glue ”)	4
Total	24.92

7. Planning for Prototype 2

- **Prototyping Test Plan for Second Prototype:**

Tests					Prototypes			
N°	Objective (Why)	Test Method (What)	Usage of Results (How)	Test Duration (When)	Type (What)	Objective (Why)	Fidelity	When to realise
1	Effectiveness of video	Continue to find viewer reception to the anti-autonomous weapons message	Take input from users before and after seeing the concept	1 hour	Survey and user data collection	An effective anti-autonomous weapons message	Medium	2025-03-27
2	Deployed attachment dimensions	Measuring the new clamp attachment	Measuring dimensions, seeing if the marker reaches the ground	1 hour	Focussed physical	Reach of updated modification	Low	2025-03-09
3	RoboMaster line following	Tweak the previous code instructions from protype 1 to support the new clamp attachment	Trial and error while adjusting values incrementally on the software	2 hours	Focussed physical and digital tests	Correct movement instructions for the RoboMaster to draw smoothly	Low	2025-03-20
4	Weight of attachment	Weighing the updated clamp modification	Finding weight to determine if the RoboMaster will support the attachment	30 min	Focussed physical	Weight of modification to be supported	Low	2025-03-09