Daniel Felix Ritchie School
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UNIVERSITY OF DENVER

Detail Design Review

Team 6:
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PROJECT OVERVIEW

CUSTOMERS' NEEDS

CLEAN ROOM VEHICLE

I. Autonomous
II. Transportation of Objects
III. Color Detection
IV. Obstacle Avoidance
V. Traversal of Various Inclines
VI. Size Constraints

CONOPS

STEPS

I. Select Task
II. Press Start
III. Carry Out Task
IV. Error Detection / System Failure
V. Maintenance

Deliverables

Prototype

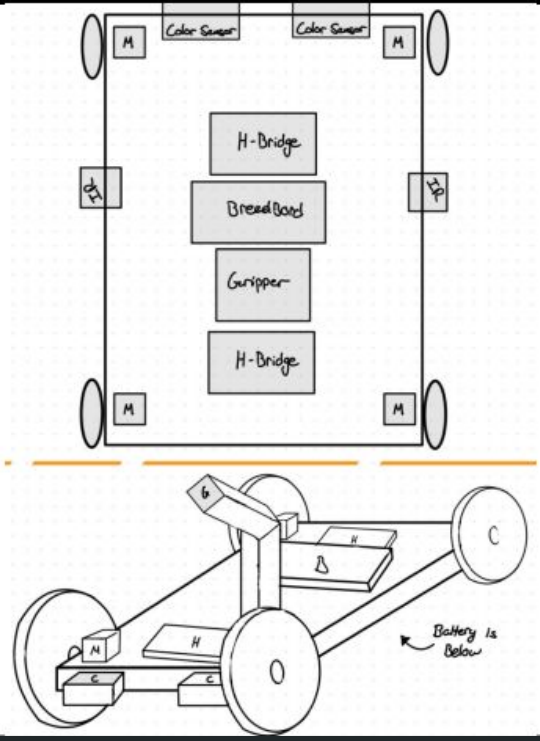
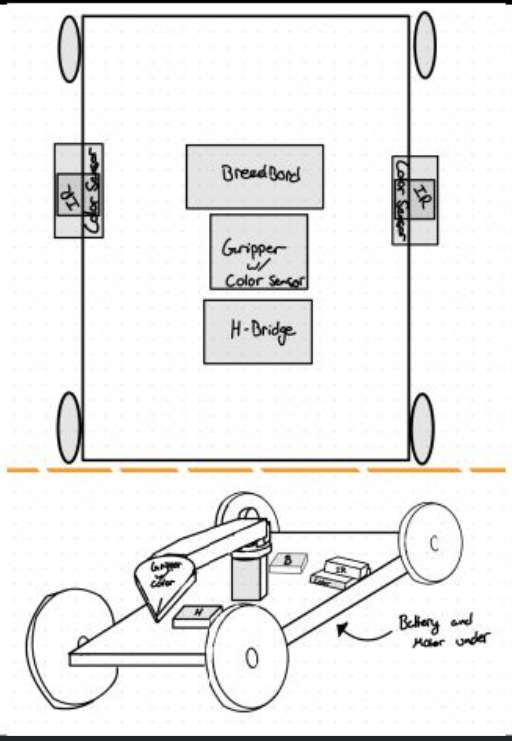
Documentation

PROJECT DEVELOPMENT

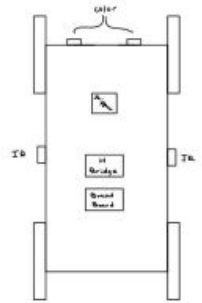
Design Matrix

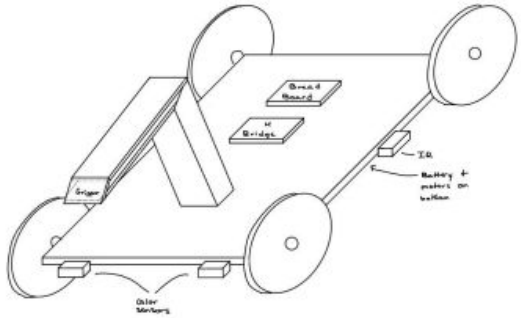
CRITERIA

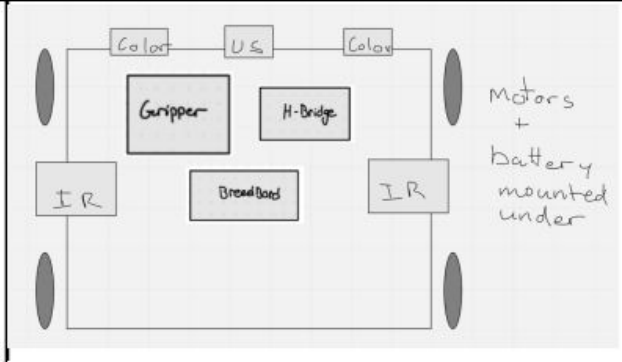
	WEIGHT	REASONING
LOAD CAPACITY	4	• HIGH TORQUE MOTORS
COMPLEXITY	4	• CUSTOMER/PROJECT REQUIREMENTS
MANEUVERABILITY	3	• MIDGROUND FOR ALL REQUIREMENTS
EXPANSION CAPABILITY	3	• MODULAR TO CLIENT SPECIFICATION • ADDITIONAL ADD-ONS
DURABILITY	2	• AUTONOMOUS SYSTEMS PRONE TO ERRORS
MAINTENANCE	2	• NO NEED FOR SPECIAL TRAINING TO OPERATE
SIZE	1	• PROJECT REQUIREMENTS

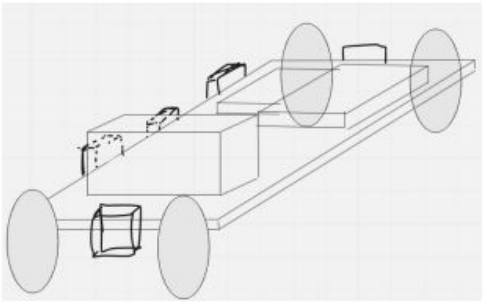
Design 1 (Score)	Weighted Score	Design 2 (Score)	Weighted Score
5	5	5	5
2	8	4	16
3	6	4	8
1	3	3	9
2	4	3	6
4	12	3	9
3	12	4	16
			

Design 3 (Score)	Weighted Score	Design 4 (Score)	Weighted Score
5	5	3	3
4	16	3	12
4	8	3	6
2	6	2	6
2	4	3	6
4	12	3	9
3	12	2	8







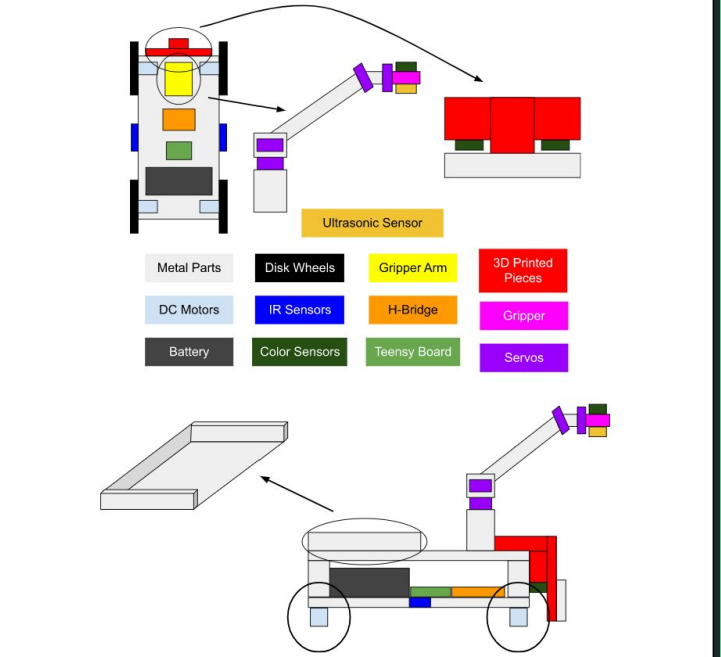


DESIGN 5 / FINAL DESIGN

- *Combination of Others*
- *Takes the Best of Each*
- *Appealing for its Complexity*

Significant Choices

- *Single H-Bridge and Single Teensy Board Design*
- *Two Level Structure*
- *Multi-Servo Gripper Arm*
- *Utilizes Disk Wheels, High Torque Motors, as well as Infrared, Ultrasonic, and Color Sensors*
- *Guard Rail and CAD Bumper Mount*

Criterion	Weight	Design 5 (Score)	Weighted Score
Size	1	4	4
Complexity	4	4	16
Maintenance	2	3	6
Freedom of Expansion	3	3	9
Durability	2	5	10
Maneuverability	3	3	9
Load Capacity	4	5	20
Design Image			
TOTAL:		74	

PROJECTED SCHEDULE

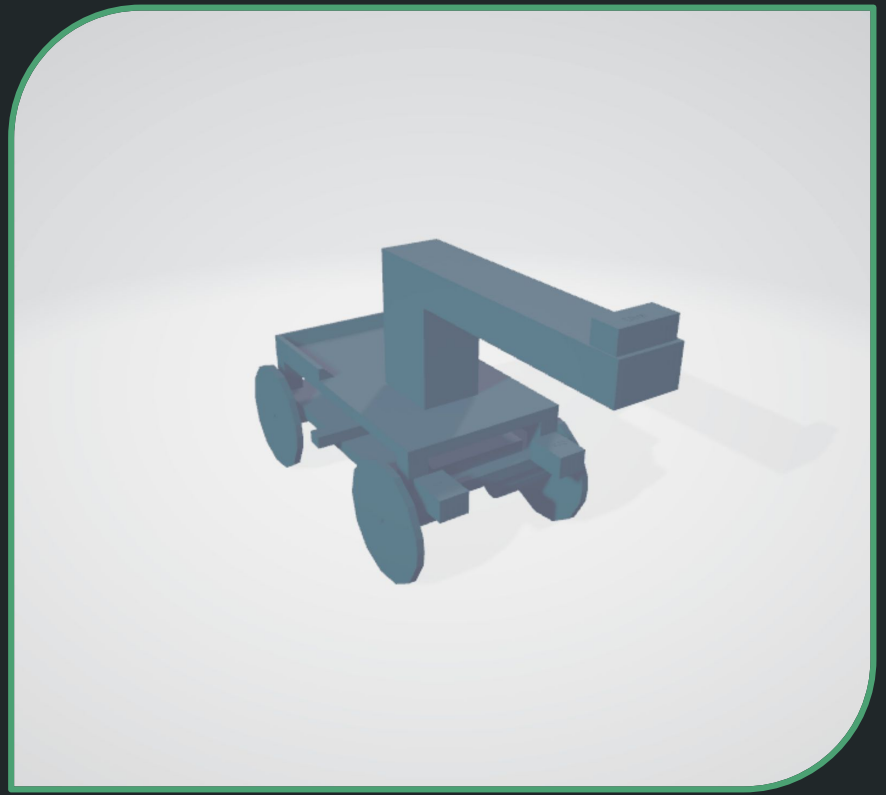
TEAM 6 AUTONOMOUS VEHICLE

Project Start:	3/20/2023			Spring Quarter										
Task	Assigned To	Progress (%)	Progress Bar	1	2	3	4	5	6	7	8	9	10	F
Phase 1 : Team Organization														
Task 1.1 : Organize team structure	EVERYONE	100%												
Task 1.2 : Setup filesystem	EVERYONE	100%												
Task 1.3 : Start documentation	EVERYONE	100%												
Phase 2 : Early Concepts														
Task 2.1 : Project Requiremnts and Design Criteria	EVERYONE	100%												
Task 2.2 : Design ideas for Basic Overview of Project	EVERYONE	100%												
Task 2.3 : Basic CAD drawings of designs	Dany / Steven	75%												
Task 2.4 : Recalibration of Color Sensors	Dany	50%												
Task 2.5 : Understaning/Setup for IR Sensors	Dany	0%												
Task 2.7 : Understaning/Setup for Ultrasonic Sensors	Dany	25%												
Task 2.6 : H-Bridge setup for 4 wheel drive	Dany	100%												
Task 2.8 : Set up gripper configuration	Steven / Elliot	50%												
Task 2.9 : Coustom Sesnors Mounts	Steven / Elliot	20%												
Task 2.10 : Electrical schematics	Dany	0%												
Task 2.# : Finalize system concept for prototyping phase	EVERYONE	0%												
Phase 3 : Prototyping														
Task 3.1 : Develop LFV Algorthim	Ryan/Dany	25%												
Task 3.2 : Develop Gripper Algorithim	Steven/Elliot	0%												
Task 3.3 : Develop Obstacle Algorithim	Dany/Ryan	0%												
Task 3.4 :														
Task 3.5 : ANAYLISIS : Power Coumsumptions	EVERYONE	0%												
Task 3.6 : ANAYLISIS : Force Needed/ Servo Stripping	Steven	0%												
Task 3.7 : ANAYLISIS : Load Bearing	Steven	0%												
Task 3.8 : ANAYLISIS :		0%												
Task 3.9 :														
Task 3.10: Finalizing system changes	EVERYONE	0%												
Phase 4 : Verification														
Task 4.1 : Verify and validate function requirement	EVERYONE	0%												
Task 4.2 : Verify and validate performance requirement	EVERYONE	0%												
Task 4.3 : Verify and validate operational and user requirement	EVERYONE	0%												
Task 4.4 : Verify and validate physical requirement	EVERYONE	0%												
Phase 5 : Finalization														
Task 5.0 : Present final product	EVERYONE	0%												
Task 5.1 : Finish mechanical system	Steven/Elliot	0%												
Task 5.2 : Finish electrical	Dany	0%												
Task 5.3 : Finish software	Ryan	0%												
Task 5.4 : Finalize verification and validation documentation	EVERYONE	0%												
Task 5.5 : Finish documentation	EVERYONE	0%												

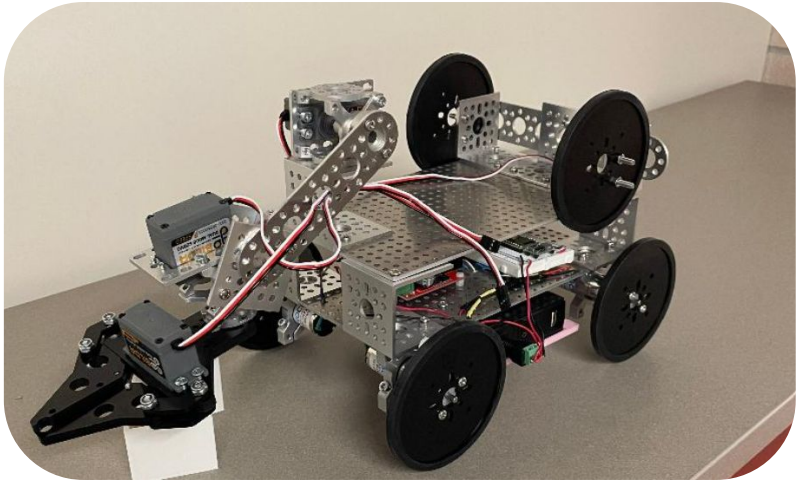
PROJECT JUSTIFICATION

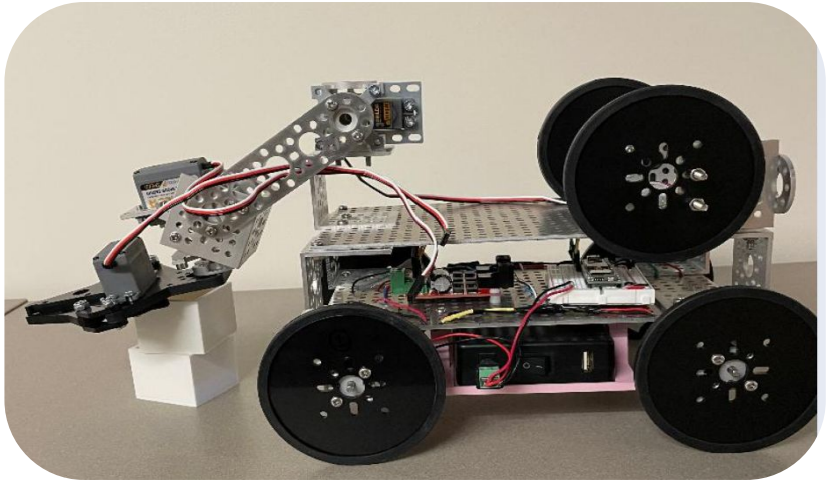
FINAL DESIGN REASONING

I. Increased Durability
II. Increased Load Capacity
III. Gripper Freedom
IV. Freedom of Expansion
V. Balance of Complexity



PROJECT CURRENT STATE





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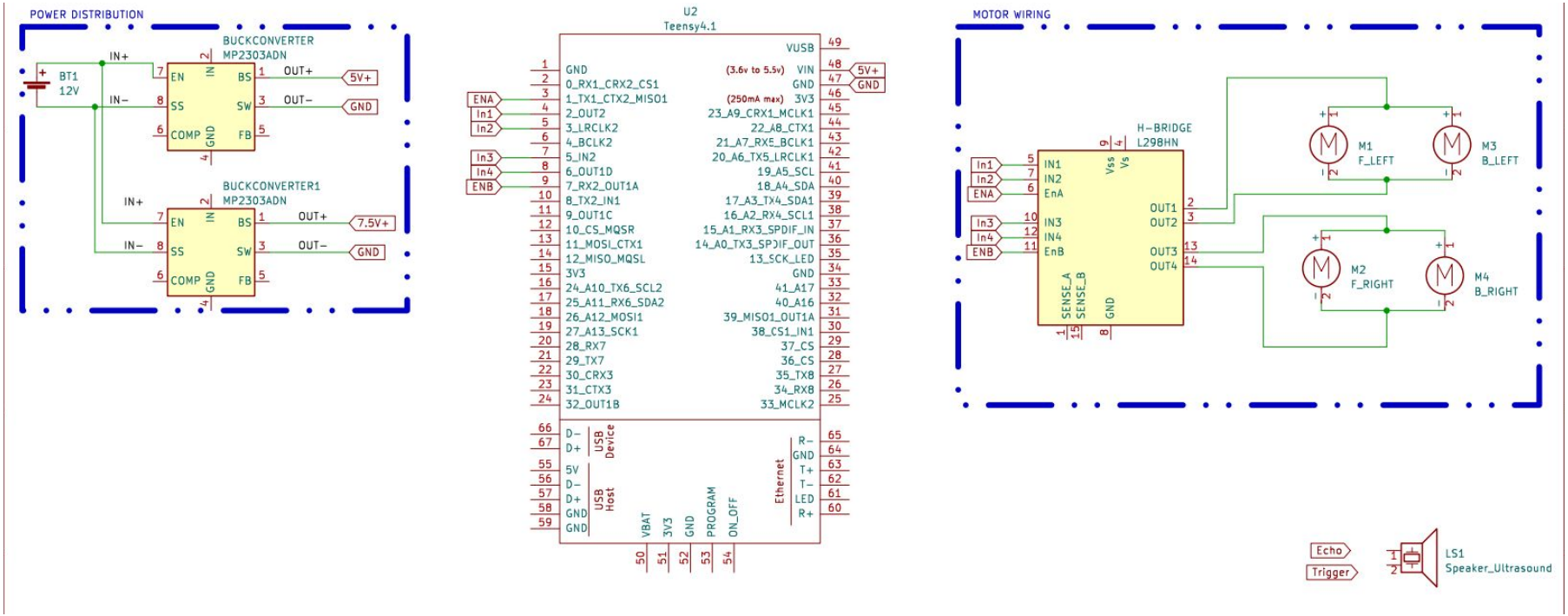
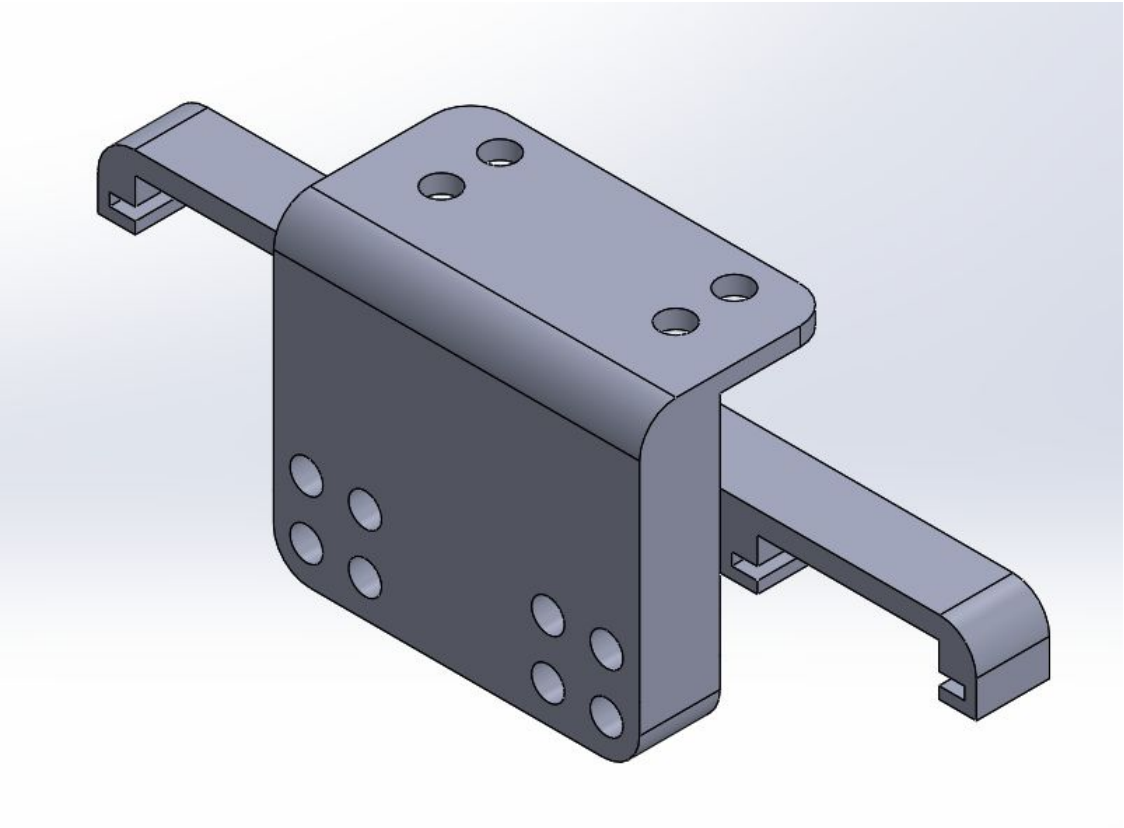


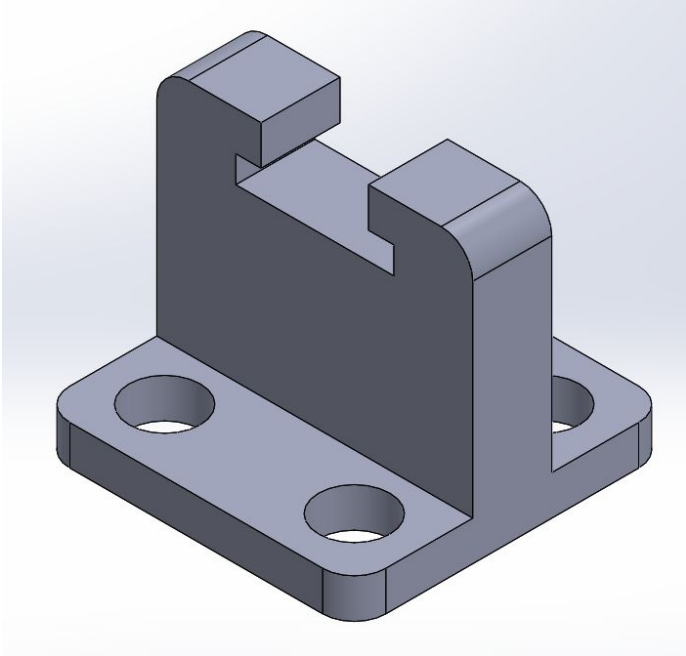
PROJECT CURRENT ISSUES

I. UNBALANCED WEIGHT
II. GRIPPER ALGORITHM
III. CORRECTIVE LINE FOLLOWING TUNING

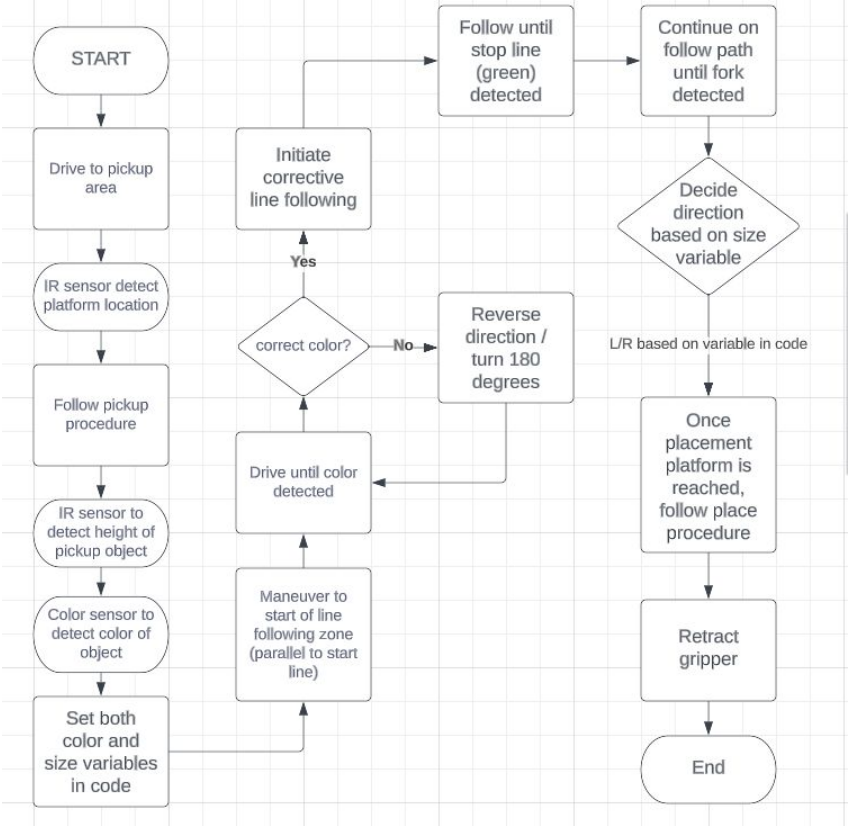
In Progress

CAD Models





Algorithm I


START
Drive to pickup area
IR sensor detect platform location
Follow pickup procedure
IR sensor to detect height of pickup object
Color sensor to detect color of object
Set both color and size variables in code
Maneuver to start of line following zone (parallel to start line)
Drive until color detected
correct color?
No
Reverse direction / turn 180 degrees
Yes
Initiate corrective line following
Follow until stop line (green) detected
Continue on follow path until fork detected
Decide direction based on size variable
L/R based on variable in code
Once placement platform is reached, follow place procedure
Retract gripper
End

QUESTIONS