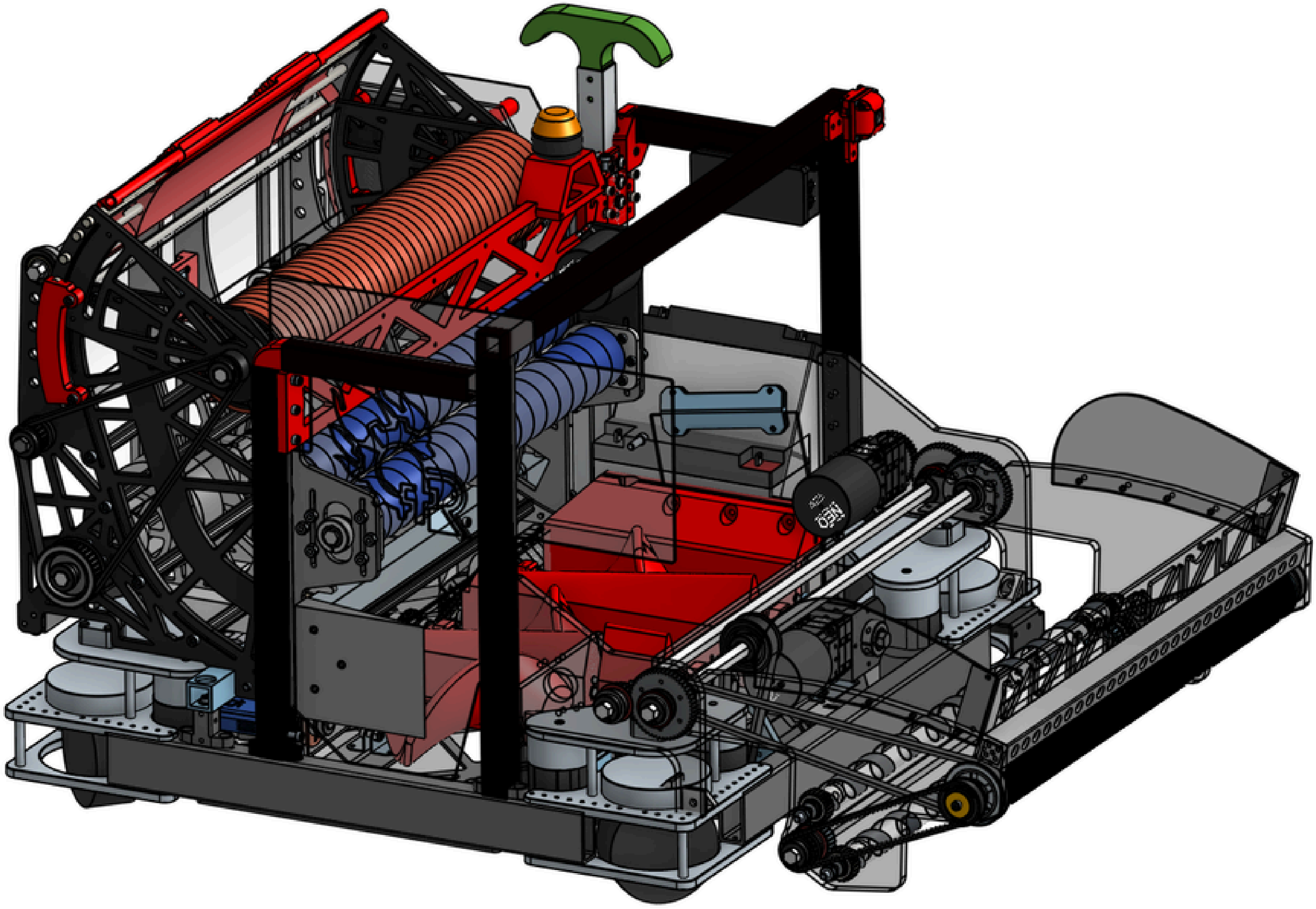
Technical Binder

2026 - Meteor Shower



8089 ROCKWAY ROBOTICS

Build Wonder. Build Respect.
Build Bridges. Build Robots

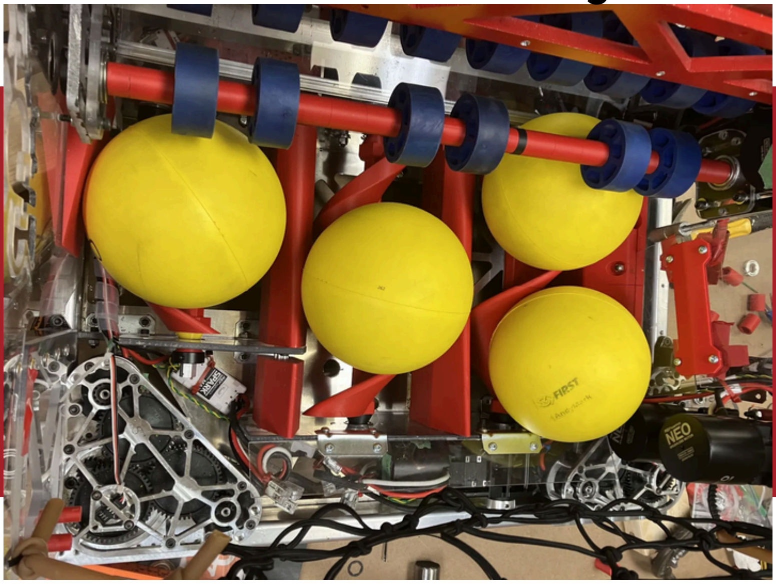
METEOR SHOWER V3

Now With Newly Inproved Intake + More Storage

- 3 fuel wide drum shooter; 10-12 BPS
- Variable hood for multi-angle shooting
- Can shoot from any zone into alliance zone
- Auger indexing for shooter sequencing
- **36 fuel capacity**
- Trench and bump bot
- **Retractable Slapdown intake**
- **L1 Climb with algae**

Key Design Feature:

Augers are used to index fuel into our 3-wide drum shooter, for greater shot consistency



INTENTIONAL, ROBUST, CONSISTENT

8089 ROCKWAY ROBOTICS

OFFSEASON 2025

THE PATH TO SWERVE AND VISION

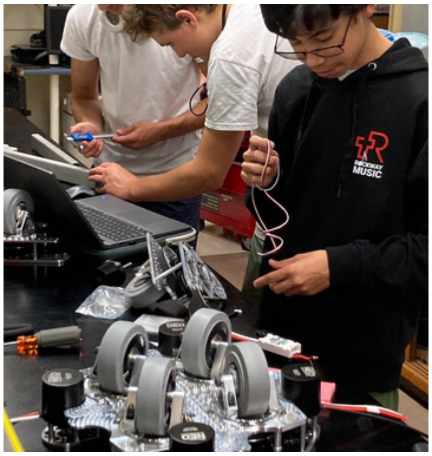
In 2025, 8089 was the top ranked tank drive robot in the Ontario district. Based on our performance, only placing #41, we knew that in order to improve in 2026, we needed to upgrade to swerve. As well, we were planning to upgrade and integrate vision into our code in the offseason. To effectively use the benefits of vision, swerve drive is essential. To find out how to use swerve, we installed our 2025 coral mechanism onto our new MK4I swerve base and competed at STEMLY Overtime Sunday.

Goals:

- Controllable swerve chassis ✓
- Coral mechanism retrofitted to fit swerve chassis ✓
- Vision assisted coral scoring ✓

Learnings:

- Discovered assembly issues, rebuilt all modules before 2026 season
- Code basis for swerve drive
- Code basis for AprilTag detection and pose estimation

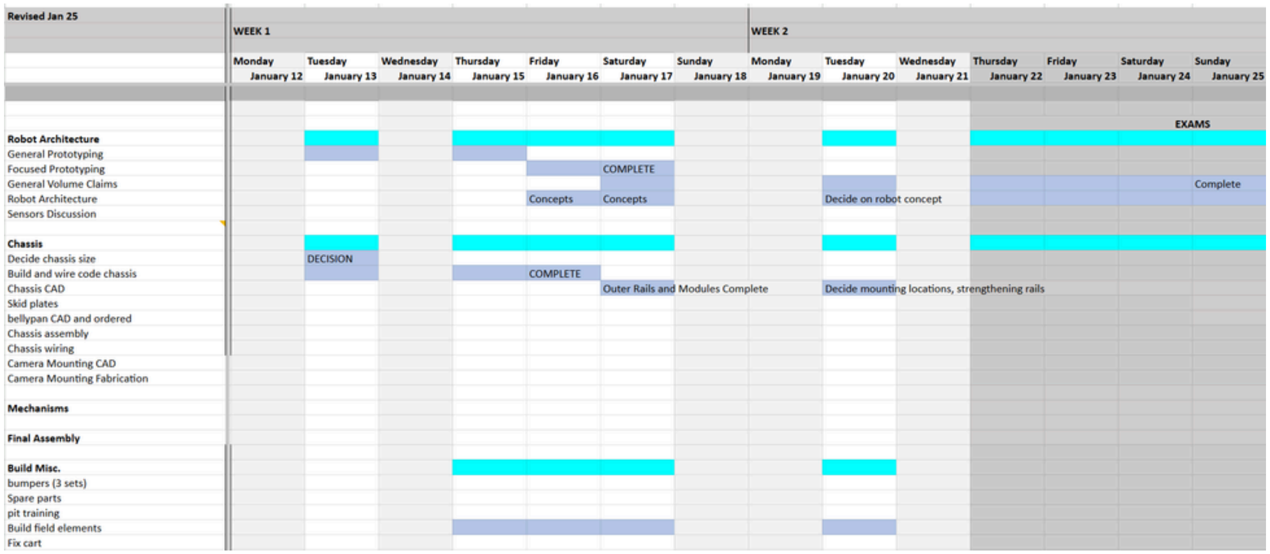


When we tried the swerve drive in competition, we saw huge success, and made it to the quarter finals. Not only that, but for our swerve drive to work, we added cameras, to act as our eyes. Using the cameras, we were able to line up using the AprilTags. Being able to move in all directions without turning our robot, and use AprilTags, will be a huge improvement. 2026 is our first competition with swerve drives, and we are so excited to see how much better we will do with these improvements.

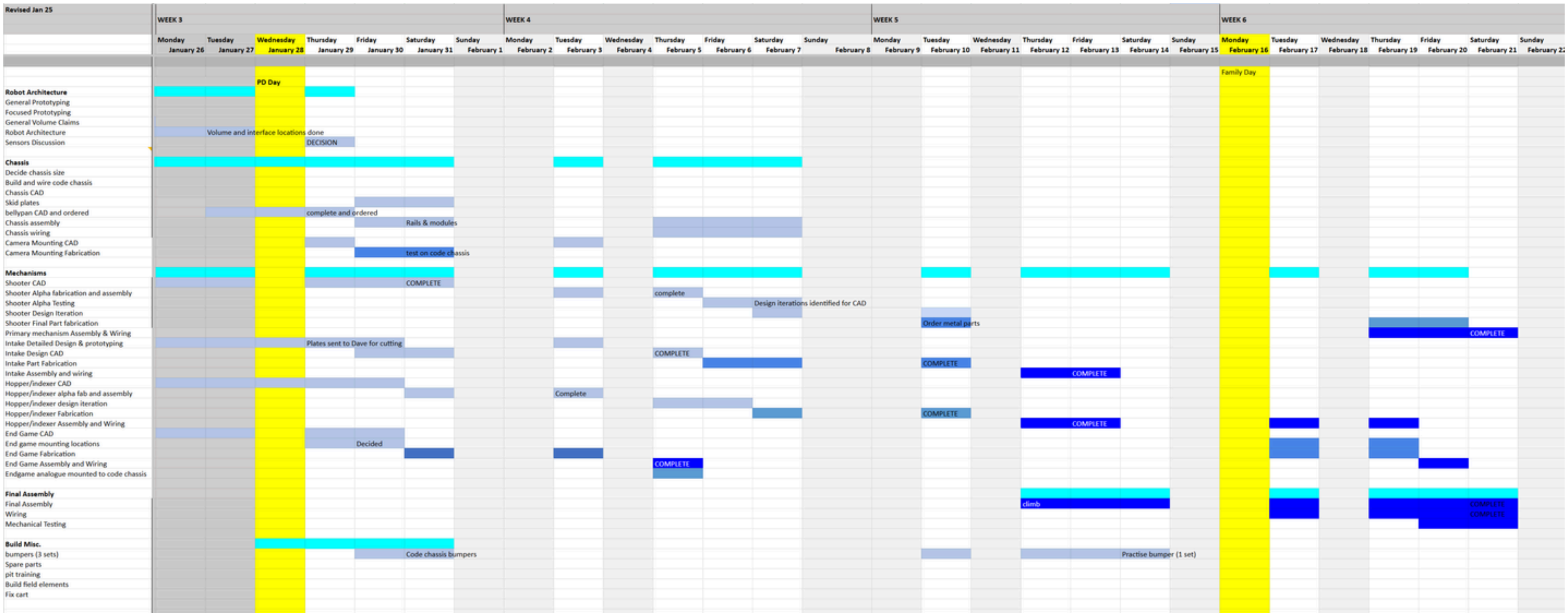
2026 SEASON SCHEDULE

Based on our learnings in the offseason, the most important factor for a consistent performance is time for code tuning. So, our goal for the 2026 season was to deliver a mechanically and electrically complete robot by the end of week 6 of build, allowing two weeks of shakedown and tuning testing before our week 2 event. This was a significant departure from past years, where the design and build continued until just before load-in.

We slipped by ~1 week on the schedule, leaving one week for testing and code. However, the shooter and indexer were delivered in advance of that, so there was some tuning before the full assembly was complete.



Revised Jan 25	WEEK 1							WEEK 2						
	Monday January 12	Tuesday January 13	Wednesday January 14	Thursday January 15	Friday January 16	Saturday January 17	Sunday January 18	Monday January 19	Tuesday January 20	Wednesday January 21	Thursday January 22	Friday January 23	Saturday January 24	Sunday January 25
													EXAMS	
Robot Architecture														
General Prototyping														
Focused Prototyping						COMPLETE								
General Volume Claims														Complete
Robot Architecture					Concepts	Concepts			Decide on robot concept					
Sensors Discussion														
Chassis														
Decide chassis size		DECISION												
Build and wire code chassis					COMPLETE									
Chassis CAD						Outer Rails and Modules Complete			Decide mounting locations, strengthening rails					
Skid plates														
bellypan CAD and ordered														
Chassis assembly														
Chassis wiring														
Camera Mounting CAD														
Camera Mounting Fabrication														
Mechanisms														
Final Assembly														
Build Misc.														
bumpers (3 sets)														
Spare parts														
pit training														
Build field elements														
Fix cart														



Revised Jan 25	WEEK 3							WEEK 4							WEEK 5							WEEK 6						
	Monday January 26	Tuesday January 27	Wednesday January 28	Thursday January 29	Friday January 30	Saturday January 31	Sunday February 1	Monday February 2	Tuesday February 3	Wednesday February 4	Thursday February 5	Friday February 6	Saturday February 7	Sunday February 8	Monday February 9	Tuesday February 10	Wednesday February 11	Thursday February 12	Friday February 13	Saturday February 14	Sunday February 15	Monday February 16	Tuesday February 17	Wednesday February 18	Thursday February 19	Friday February 20	Saturday February 21	Sunday February 22
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Robot Architecture																												
General Prototyping																												
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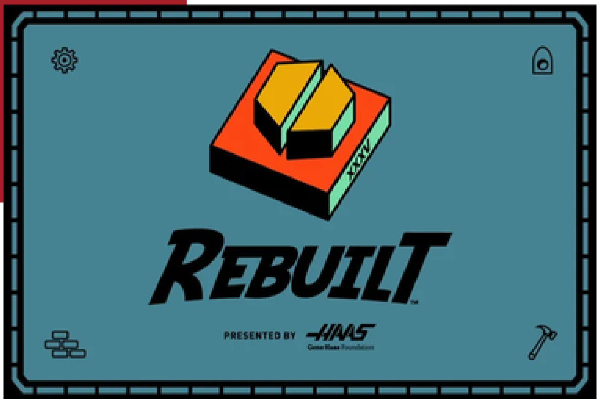
General Volume Claims																												
Robot Architecture		Volume and interface locations done																										
Sensors Discussion				DECISION																								
Chassis																												
Decide chassis size																												
Build and wire code chassis																												
Chassis CAD																												
Skid plates																												
bellypan CAD and ordered				complete and ordered																								
Chassis assembly						Rails & modules																						
Chassis wiring																												
Camera Mounting CAD																												
Camera Mounting Fabrication						test on code chassis																						
Mechanisms																												
Shooter CAD						COMPLETE																						
Shooter Alpha fabrication and assembly											complete																	
Shooter Alpha Testing													Design iterations identified for CAD															
Shooter Design Iteration																												
Shooter Final Part fabrication																Order metal parts												
Primary mechanism Assembly & Wiring																											COMPLETE	
Intake Detailed Design & prototyping				Plates sent to Dave for cutting																								
Intake Design CAD											COMPLETE																	
Intake Part Fabrication																COMPLETE												
Intake Assembly and wiring																			COMPLETE									
Hopper/indexer CAD																												
Hopper/indexer alpha fab and assembly									Complete																			
Hopper/indexer design iteration																												
Hopper/indexer Fabrication																COMPLETE												
Hopper/indexer Assembly and Wiring																			COMPLETE									
End Game CAD																												
End game mounting locations					Decided																							
End Game Fabrication																												
End Game Assembly and Wiring											COMPLETE																	
Endgame analogue mounted to code chassis																												
Final Assembly																												
Final Assembly																		climb									COMPLETE	
Wiring																											COMPLETE	
Mechanical Testing																												
Build Misc.																												
bumpers (3 sets)						Code chassis bumpers														Practise bumper (1 set)								
Spare parts																												
pit training																												
Build field elements																												
Fix cart																												

GAME ANALYSIS

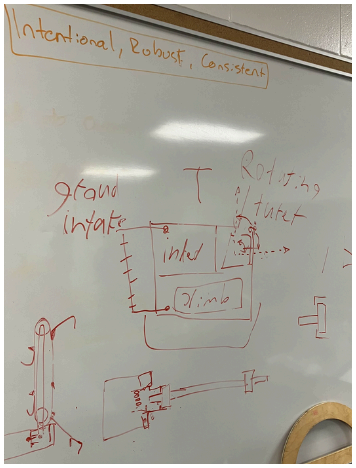
Possible Robot Tasks

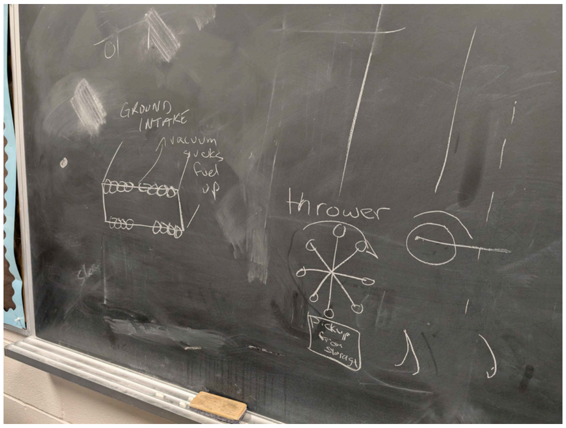
- Climb at side and middle
  - L1 in auto and teleop
  - L2
  - L3
  - Get down from L1 safely in teleop
- Score in fuel in Hub, auto and teleop
- Shoot to a point in space
- Score while moving
- Go over bump
- Go under trench
- Unstick the robot on the bump and fuel
- Push fuel into outpost
- Drive
- Intake
  - Outpost
  - Ground auto and teleop
  - Depot
- Store/hold fuel
- Defense (take hits and not break)

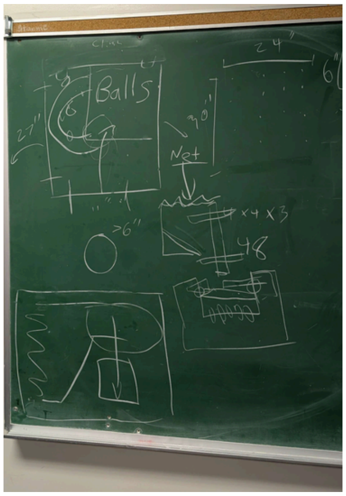


Calculating Possible Scores:

- At kickoff we used mathematical analysis to determine what hopper size and shot rate would achieve our desired score and compared it to the shoot speed required for a feeding based approach getting a sense for the advantage of each strategy.
- this also allowed us to understand the relative importance of hopper size and shot speed to scoring.
- It also quickly alerted us that climbing to l3 would not be a priority as the scores generated by plausible cycle times dwarfed climb points.
- Learning that high shooting speeds were important (and that climbing wasn't) allowed targeted prototyping and more informed robot architecture







CONCEPTUAL DESIGN

Priorities

- L1 climb in auto and teleop, get down safely
- Score a lot of fuel
- Be assembled by week 6
- Ground intake
- Score while moving
- Feed well
- Traverse bump and maybe trench
- Drive fast and consistently (driver training)
- Hold a lot of fuel (30ish or more)
- Take hits (for defense)
- L2/L3 climb (lower priority)
- Minimum of 45 fuel per period
- Be ready in time for code to work

What Should We Prototype?

- A dual roller fly wheel shooting mechanism
- How does the swerve drive behave when going over the bump?
- How much can we compress the fuel for storage and shooter purposes?
- Optimal shooter width
- How fast can we strafe while being able to shoot the hub accurately?
- How does the fuel bounce especially when shot from high angles?
- How hard is it to get beached on the fuel?
- Climb
- Does the fuel jam in the shooter easily?
- Optimal intake width?

Mechanism Concepts and Why They Were Discarded:

- A dual shooting mechanism with individual aiming. This was discarded as it was too overengineered and was impractical. I was doing far more than we needed to and with our current design there is no turret for maximum output and minimal places for fuel to get stuck.
- A large climb with less storage capacity and a rotating shooter and star wheels on the ground for the intake. This was discarded after we realized that this games scoring relied very heavily on scoring in the hub and that was far more important than having a high level climb
- A vacuum to suck the balls into the robot and a ferris wheel like contraption to throw them into the hub. This idea was discarded as a vacuum was unrealistic to get working and the ferris wheel had too many moving parts and was unlikely to work as imagined.
- Elevator climb mechanism to reach an L3 climb. This was discarded for the same reasons as the “large climb” mentioned prior and wouldn't be worth the space to score ratio.

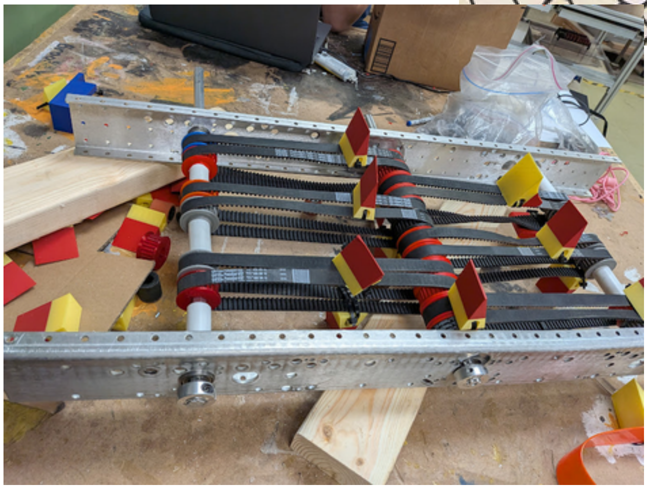
INITIAL PROTOTYPING

Learning how to interact with the game pieces to inform the robot architecture.

Determining how each wheel type interacts with fuel

Can we push fuel into an expanding net hopper?

Testing compression for fuel pickup

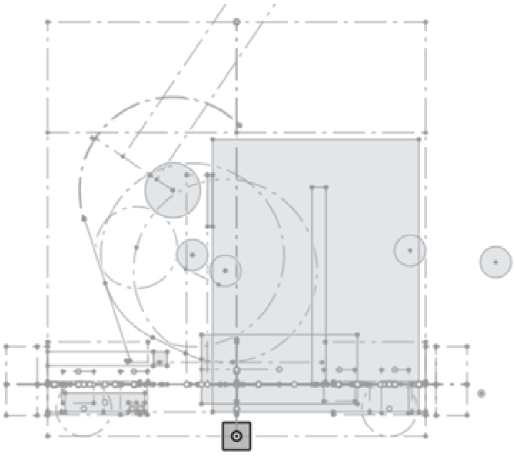


Testing indexer ideas

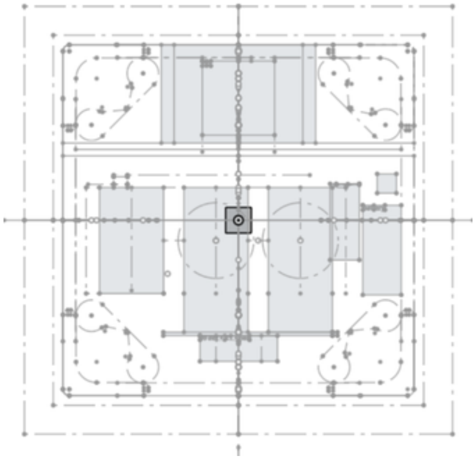
Sending the 2025 robot over the bump

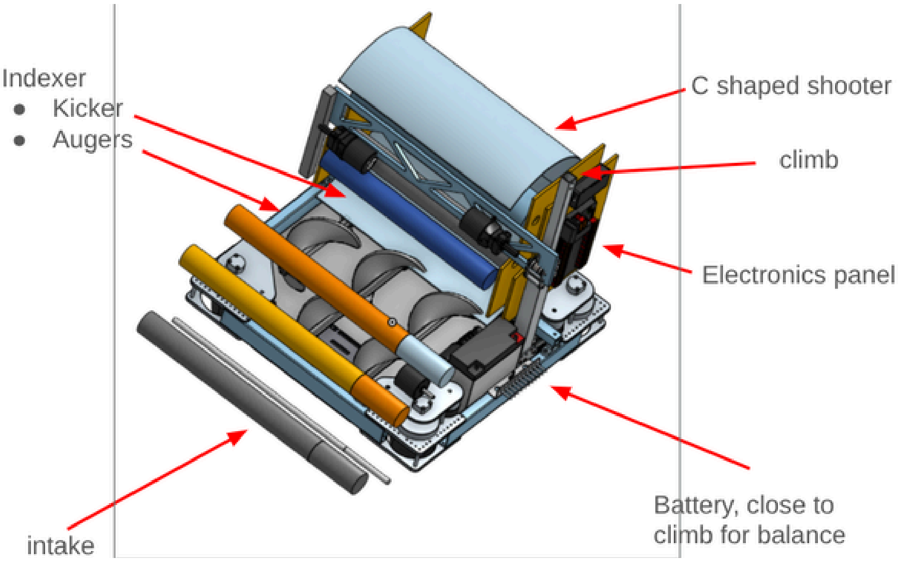
VOLUME CLAIMS AND ROBOT ARCHITCTURE

- Prototype testing proved that as long as we can feed the three ball wide shooter with fuel offset by half a fuel diameter, shooting should be consistent enough for scoring purposes
- 27.5x27.5” (max frame) to maximize hopper space
- 1 stage “climber in a box” - proven reliable mechanism, low volume claim
- Battery placed as close as possible to the climb for C.O.G considerations
- Under 22” for trench, leave the option open for an expandable net up to 30”
- Over the bumper intake, to maximize touch to own architecture and intake width
  - Do not want a frame cutout
  - Can’t mitigate strength reduction with internal rails
  - Desired for it to be retractable during the matches, to reduce chance of damage

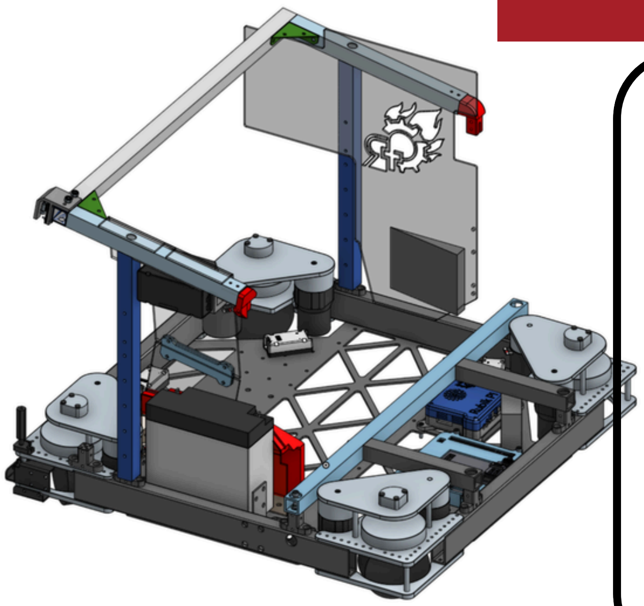


Top-Down design managed through Master Layout Sketches in Onshape





CHASSIS AND HOPPER



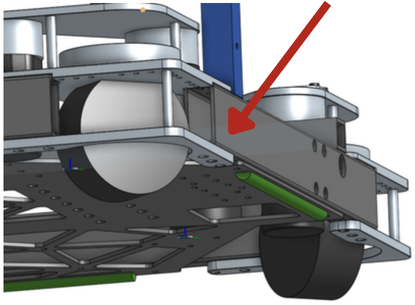
System Requirements: Hopper

- Full width
- No dead zones
- Maximize given space
- Minimum 30 fuel
- Vertically expandable
- Able to fit under trench
- Does not get caught on Field Elements
- Does not exceed 30” in height
- Does not exceed frame perimeter
- Able to manually remove balls

System Requirements: Chassis

- Drive
- Get over the bump
  - Straight-on
  - medium speed; not fast
  - minimal air time
  - no beaching on fuel
- Swerve covers that stay on
- Stay within perimeter restrictions
- Hold bumpers
- LEDs for signaling drive team and for troubleshooting

- 1/8" 2x1" frame rails
- Very little space for strengthening rails around the planned indexing method (augers) so ⅛” lightened bellypan was required for strength
- Mounting locations designed in for RoboRio, Battery, Rubik Pi, and front camera
- Majority of the fuel containment is provided by other subsytems, so hopper is lightweight
- Polyethylene skis on bottom of rails to help bump travel



Iterations After Assembly and Testing:

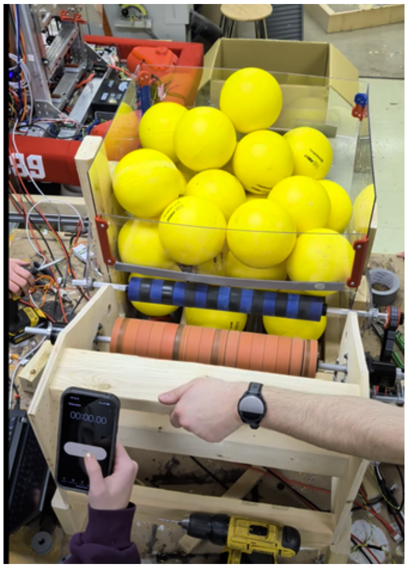
- Added polycarbonate and 3D printed gap fills to remove dead and jam spots.

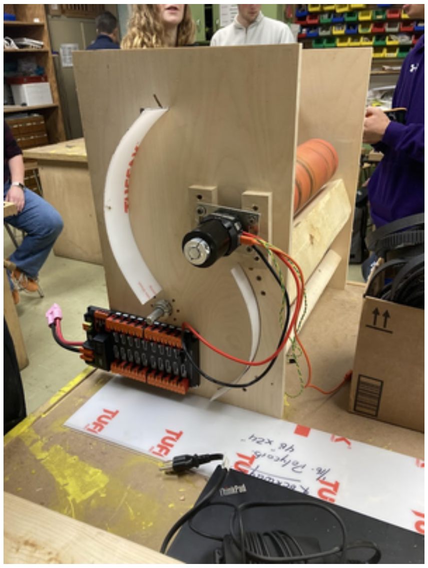
SHOOTER

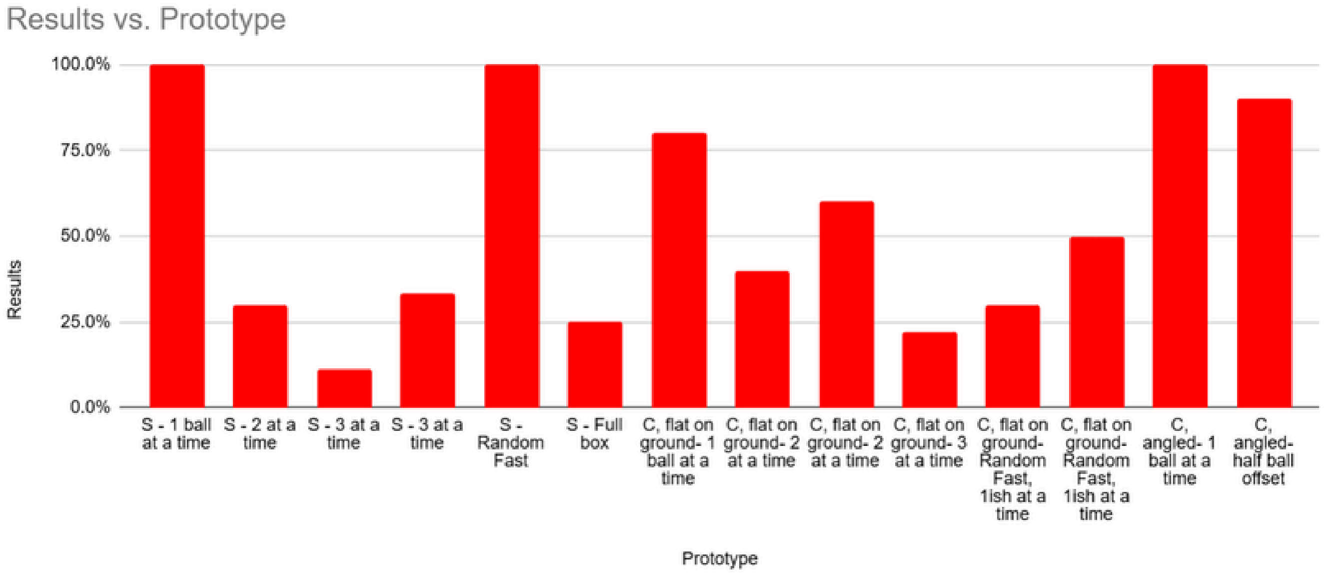
System Requirements

- 10 balls per second
- Shoot to a consistent location
- Min. 90% accuracy from anywhere in Alliance Zone
- Fit under the trench
- Full field shot
- Low power eject

- Prototyping showed that we could build a drum shooter, as long as we could feed it consistent number of fuel at at time
- We tested both C and S shooters, without much change in performance. C shape was chosen for packaging ease

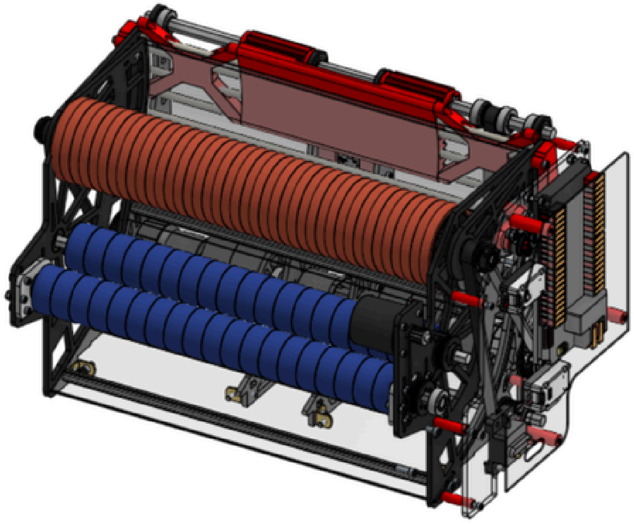


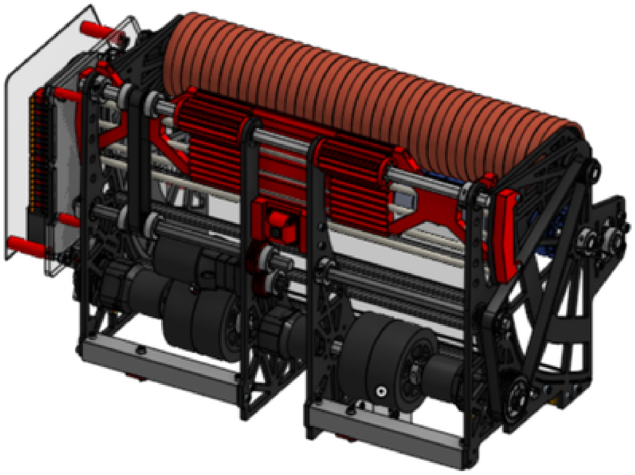




SHOOTER

- Uses High ball path and specialized double adjustable kickers to stabilize the shot
- 3 balls wide
- Weighted flywheels with a Ratio to make them more efficient
- Includes electronics panel for easy access

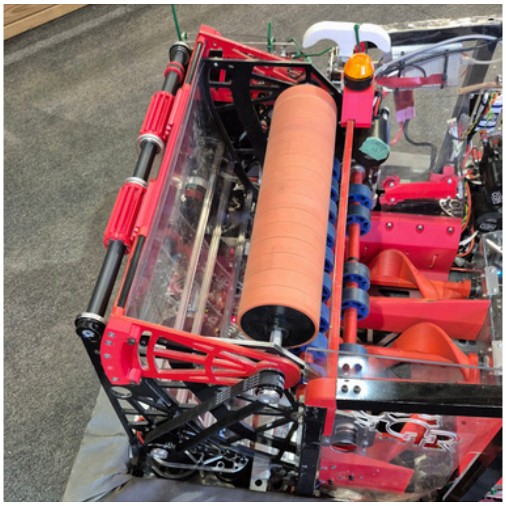




- Worked through many different designs including double roller shooters and fixed hood shooters, settling on our current Variable Hood when we realized we wanted to shoot from distance, but that being able to adjust quickly was important too.
- Based on calculations, we needed a 15-45 degree variable hood
- Tested lots of different belt ratios to figure out what worked for our robot, and our weight limit.

Iterations After Assembly and Testing:

- Middle back plates changed from Al to Polycarbonate
- Removed idler pulleys
- Optimized number of kicker and drum wheels
- Moved weighted flywheels to motor shaft

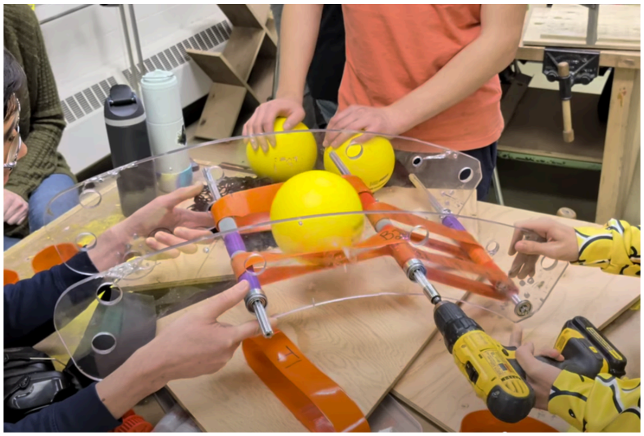


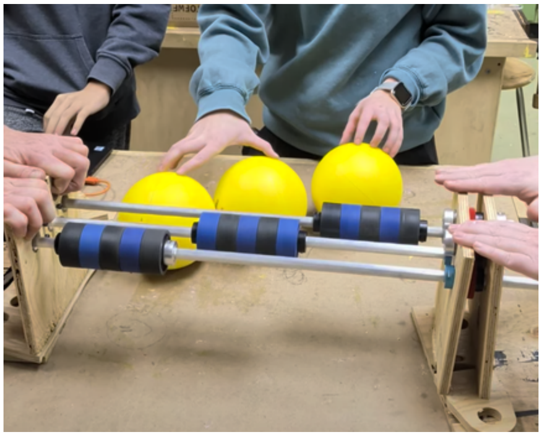
INDEXER

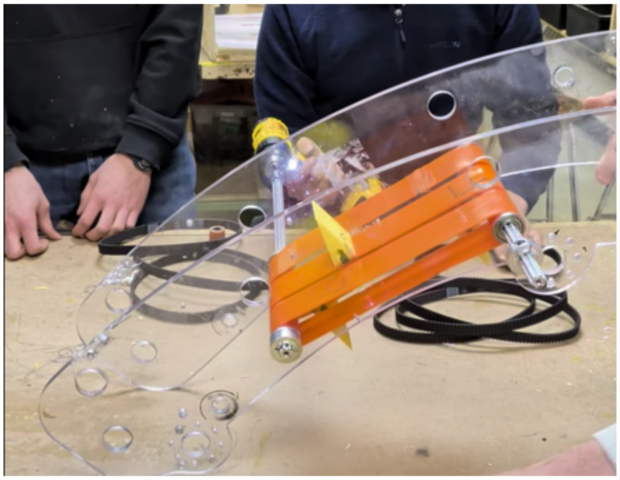
System Requirements

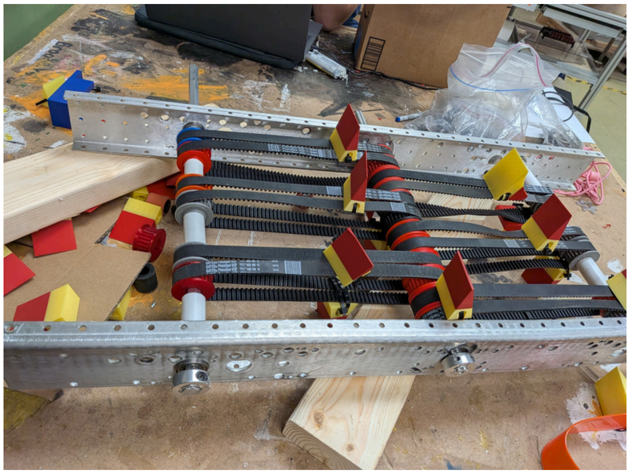
- Feed faster than we shoot
- 10+ balls per second
- Not feed when we do not want to shoot
- Does not jam and no dead zones
- Fullness levels don’t matter
- No parts that break
- Does not damage balls
- Does not eat electronics, or damage 5V line
- Able to manually remove balls
- Be small and compact
- Must be easy to remove and fix
- Must feed balls sequentially

- The indexer is the most important system on the robot. Fuel must feed consistently into the shooter in order to achieve consistent scoring
- Many versions of an indexer were prototyped, each building off the one before


Different types of belts

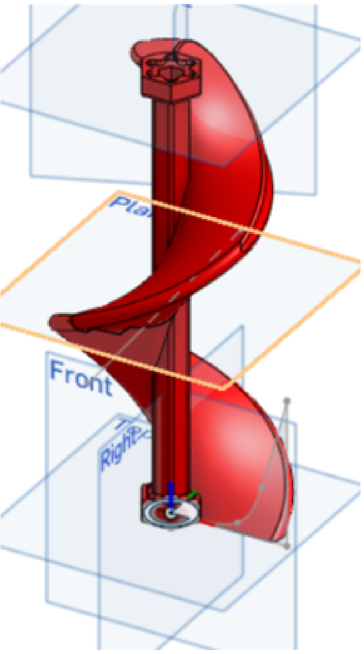

Sequencing rollers





Belts with spikes

INDEXER

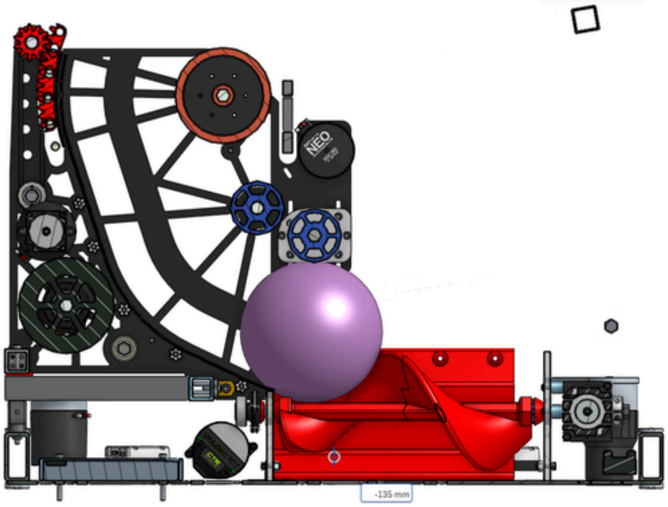


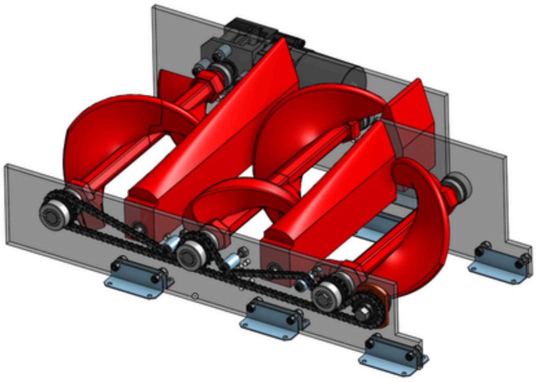
A singular auger

We worked to test required length and diameter of augers for effective indexing.

After 6 Major prototyping iterations of the augers we learned:

- A kicker wheel is necessary to pull fuel off the augers into the shooter.
- Augers must have a diameter of at least 5in to hold the balls in
- Thread should point inwards to prevent balls jamming against the walls of the hopper
- Augers should have tapered ends to ensure consistent compression with the kicker at end of the hopper and prevent jamming against it.
- A robust drivetrain is required to drive auger and keep them at correct relative positions.
- Dividers between augers are necessary to prevent augers from pushing balls sideways, dividers must taper to prevent jamming at kickers



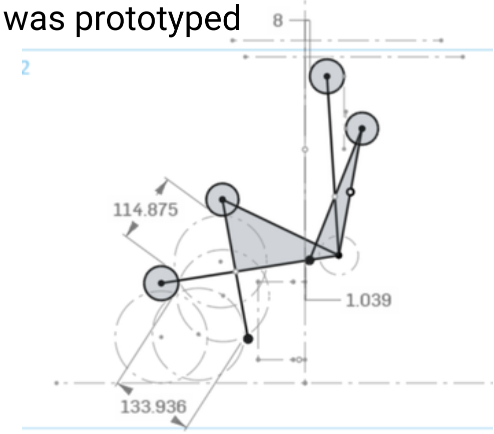


INTAKE

System Requirements

- Quickly lift and go back down
- Pack the hopper (including net)
- Fuel spends as little time as possible in intake
- Reverse as necessary (does not pull from hopper)
- No jam/squish points
- ROBUST!
- Motors ideally inside drivetrain
- Use as little space as possible when retracted
- Seal the hopper when retracted

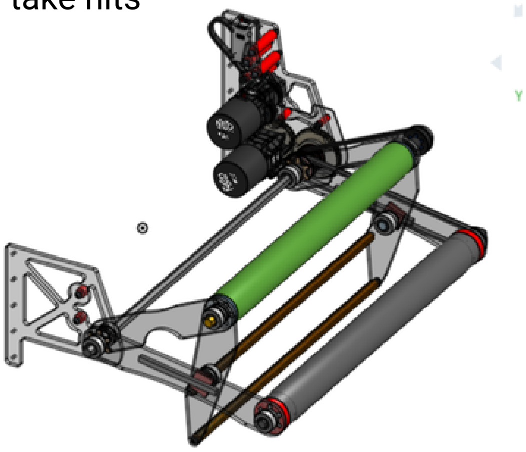
- Prototyping focused on compression through the ball path
- In order to retract, a slider-pivot linkage was prototyped



- The extended and retracted positions were laid out in CAD in order to determine the link lengths
- Then, the linkage geometry was developed
- The front roller is carbon fiber, to be able to take hits

Iterations After Assembly and Testing:

- Reduced distance between rollers in extended position
- Raised bottom kicker bar on link to give more perimeter clearance
- Added Al mounting plates to slider
- Added 3D printed jam preventers
- Added net for expanding capacity



CLIMB

System Requirements

- Climb to L1 in auto (and hold)
- Climb down from bar
- Climb to L1 in teleop (and hold)
- Leave room for at least one other robot
- Stored within frame perimeter
- Ability to climb at least two positions on bar
- Able to climb in 5 seconds
- Uses minimal space (“climber in a box”)

- From the beginning, as a way of saving time, effort and cost we decided to use a modified AndyMark Climber-in-a-Box from a previous year.
- Prototyping was as straightforward as bolting this pre-existing climber on a vaguely robot-shaped bumper frame and driving it with a cordless drill.

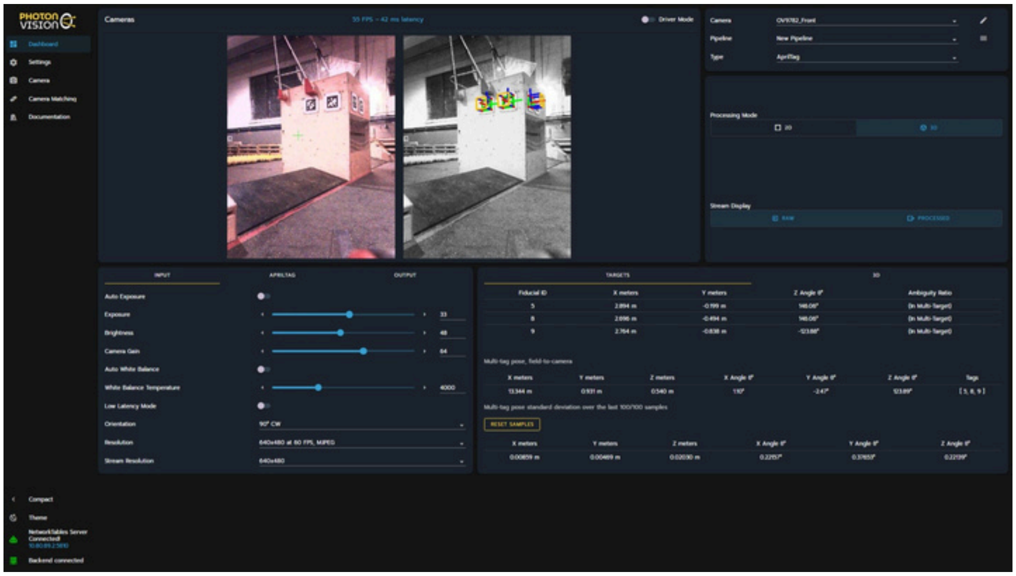
- Climb design incorporates the MaxPlanetary Brake in order to come down after the auto period
- We were sucessfully able to climb on our home-built tower, however when testing on a to-spec tower our hook slips off.
- Modifications were de-priotitized in favor of the code team tuning automatic scoring and auto paths for our first competition

VISION

System Requirements

- Detect AprilTags
- Accurate pose estimation
- Auto-align with hub
- Calibratable distance measurements
- Fast correction after collision, bump or drift
- Within budget

- Prototyped with a loaner Limelight 2 from Sir Lancerbot (4917) in off-season.
- Looked into many vision systems, including the LimeLight 4 and the RUBIK Pi 3.
- Chose RUBIK Pi 3 and two global shutter cameras (one mono, one colour) due to budget constraints.



Camera: OV9782_Front
Pipeline: New Pipeline
Type: AprilTag

Auto Exposure
Exposure: 33
Brightness: 48
Camera Gain: 64
Auto White Balance
White Balance Temperature: 4000
Low Latency Mode
Orientation: 90° CW
Resolution: 640x480 at 60 FPS, MJPEG
Stream Resolution: 640x480

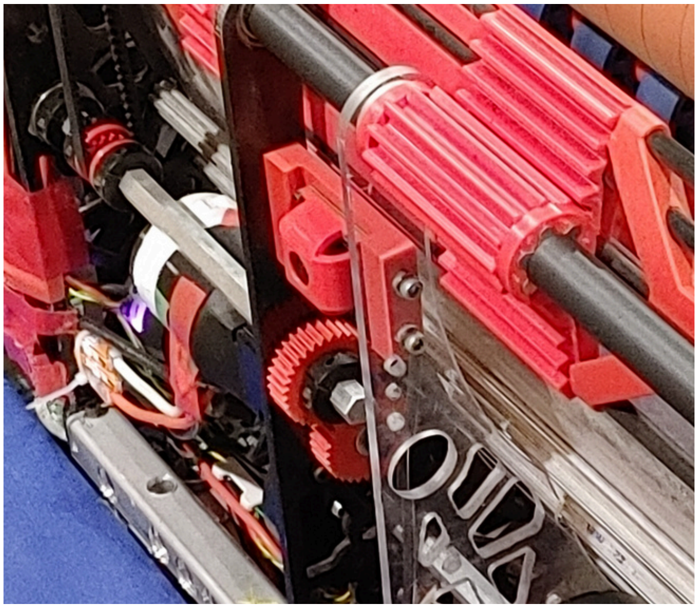
Fiducial ID	X meters	Y meters	Z Angle θ°	Ambiguity Ratio
5	2.894 m	-0.199 m	146.06°	(In Multi-Target)
8	2.896 m	-0.494 m	146.06°	(In Multi-Target)
9	2.764 m	-0.838 m	-123.88°	(In Multi-Target)

Multi-tag pose, field-to-camera

X meters	Y meters	Z meters	X Angle θ°	Y Angle θ°	Z Angle θ°	Tags
13.344 m	0.931 m	0.540 m	1.10°	-2.47°	123.89°	[5, 8, 9]

Multi-tag pose standard deviation over the last 100/100 samples

X meters	Y meters	Z meters	X Angle θ°	Y Angle θ°	Z Angle θ°
0.00859 m	0.00469 m	0.02030 m	0.2257°	0.3765°	0.2239°



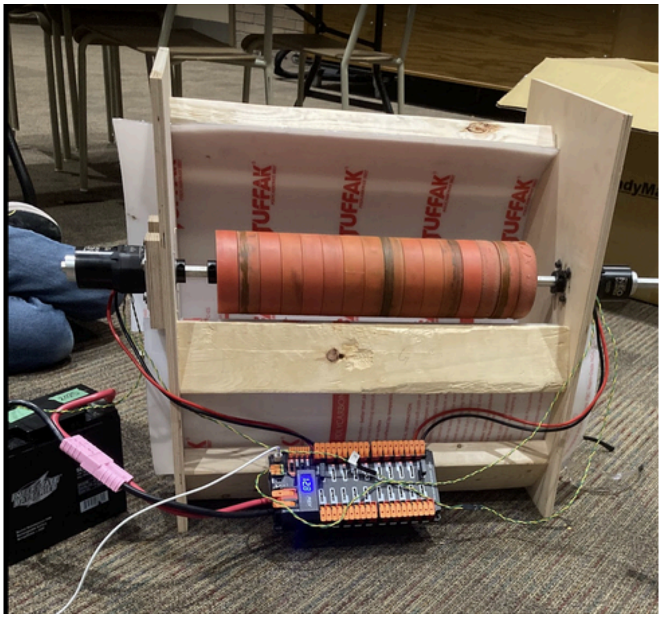
- Chose PhotonVision to have a well-tested solution with support from the FRC community and support for our hardware.
- Learned to calibrate camera focus and position to improve pose estimation.
- Researched other solutions for auto-alignment and then developed our own based on the results.

CODE

System Requirements

- Versatile auto routines
- Replay logging
- Field relative drive with swerve
- Testable robot code in simulation
- Quickly configurable tuning values

- Used 6328's AdvantageKit Spark Swerve Template for quick start.
- Learned to use LoggedNetwork values for quick configuration.
- Extensive research into reducing noise and drift on absolute motor encoders.
- Customized template for TTB 3 pin encoder



- Separated code into 9 individual subsystems for fine command and control.
- Used simulation to write code before robot was built (a team first!)
- Created Auto routines in advance with PathPlanner and tested them on our local Practice Field before our first competition.

DURHAM RECAP

How We Did

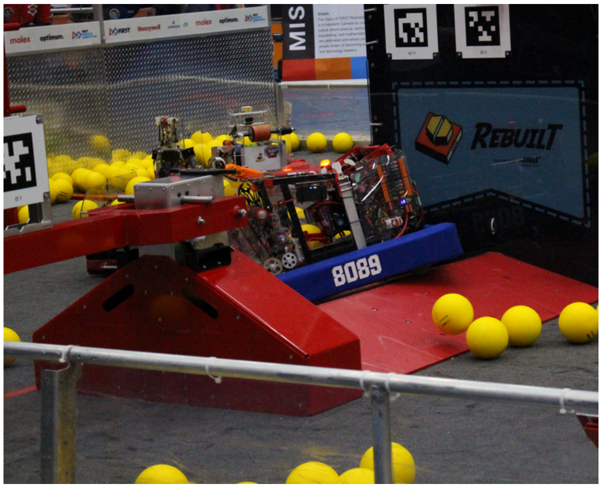
Award: Imagery

Ranking: 16

Joined Alliance 8

What we learned:

- Our second roller should be faster on the intake
- 3d printed pulleys are vulnerable to tensioning problems
- The battery wasn't secure enough
- Metal on gears should be the same



What we will change:

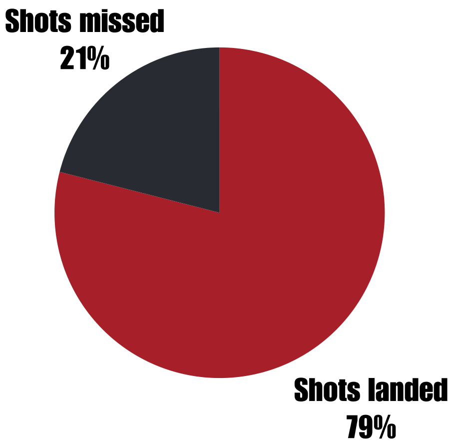
- Intake redesign
- Printing pulleys out of polycarbonate
- Ziptie the battery down
- Make both gears steel

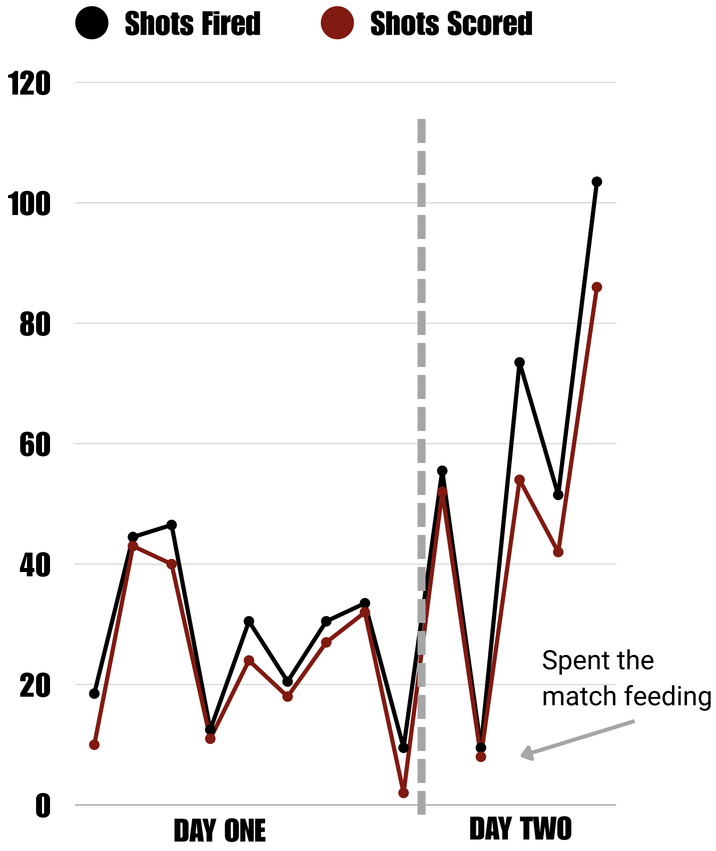
STATISTICS - DURHAM

One thing we are focusing on being consistent. In this case we have been consistently mapping data during prototyping and competitions. This allows us to see success rates for specific tasks so we can focus our efforts on increasing those rates.

Shot Accuracy

By gathering statistics on what the optimal RPM speed of our flywheel and the angle of the hood we were able to shoot accurately from different locations around the field.





Results at Durham

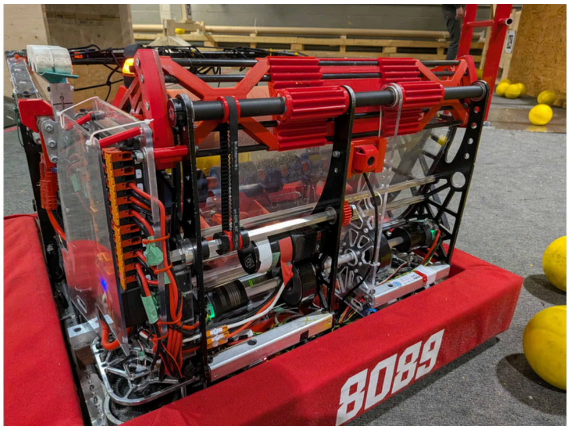
Unfortunately on our first day at Durham our intake experienced a jam where balls would get stuck between the two rollers. To fix this problem we changed the gearing on our second roller so it was faster than the first roller to prevent jamming. As a result our performance improved greatly on the second day and we jumped over ten places in the rankings between the first and second day. This shows how our team's perseverance pushing through difficult problems during high stress situations paid off.

MECH UPDATES AFTER DURHAM

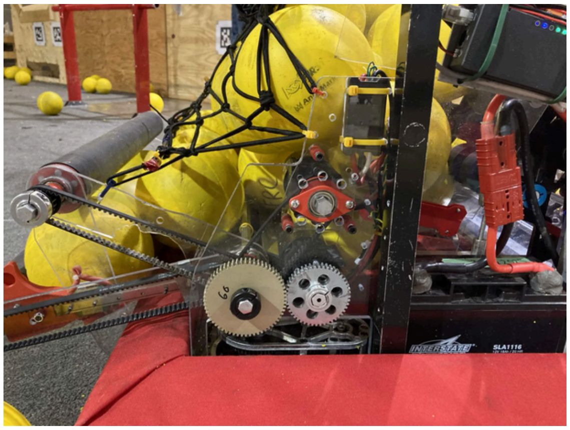
- Make intake supported independently from hopper plates
- Created secondary plate to support auger chain idler pulley
- Added a metal support plate for the hood gear box and gears to decrease backlash and improve hood accuracy
- Added top net to retain fuel while moving
- Improved stability of bumpers and changed mounting to quick-release pins

Climb Improvements:

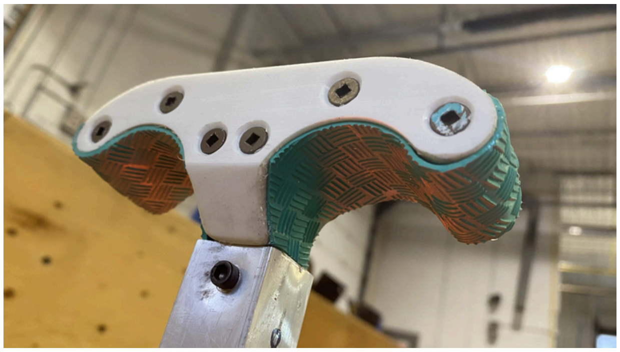
To improve our climbing mechanism we found that using a small piece of an algae from last years game Reefscape was an excellent way to improve the traction allowing us to successfully climb and remain in the air during auto and teleop.



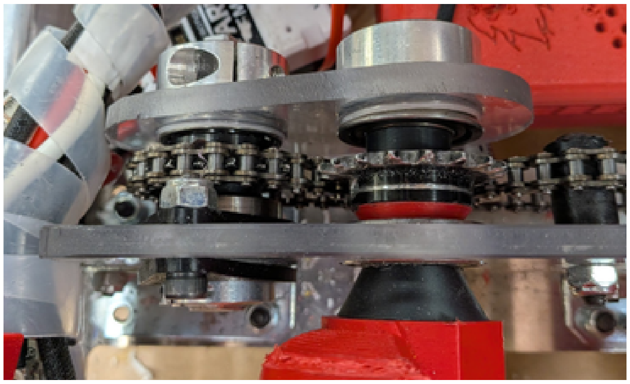
Metal plate for hood motor



Intake mounting redesign



Newly Improved Climb



Renforced ideler pulley

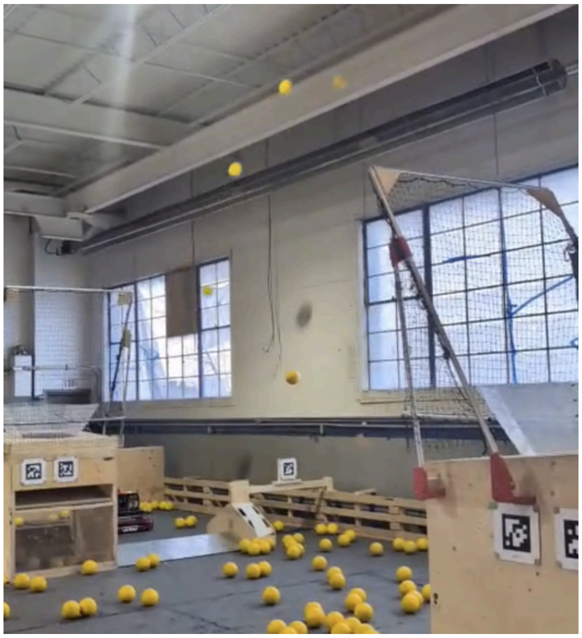
CODE UPDATES AFTER DURHAM

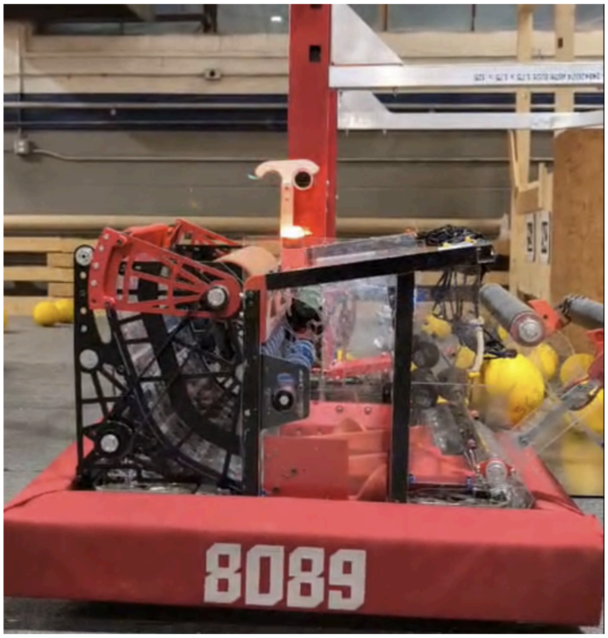
Magic Trigger!

- Reacts to location on the field to automatically change hood angle and RPM based on targets
    - Feeds to center of alliance zone from neutral and opposite alliance zone
    - Aligns to Hub when in our alliance zone

Optimizations

- Retuned shooter and other set-points to increase throughput and accuracy
- Increased auger speed from 20% to 60%
- Changed intake setpoints to account for increased robustness





Autos

- Increased speed into the neutral zone
- Increased accuracy of shot from new tuning
- Added Left Auto Climb as an option to paths

Climb

- 3s to climb once aligned
- Added auto-align feature; driver holds button to line-up, releases to cancel
- Functional on both sides of tower, but Left side only in Auto

WATERLOO RECAP

How We Did

Award: Team Spirit

Ranking: 8

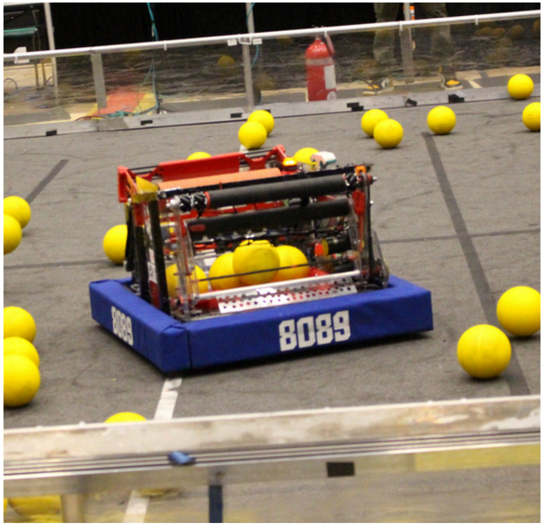
Captained Alliance 5

Semi finalist for First Leadership award

Woodie Flowers nominee

What we learned:

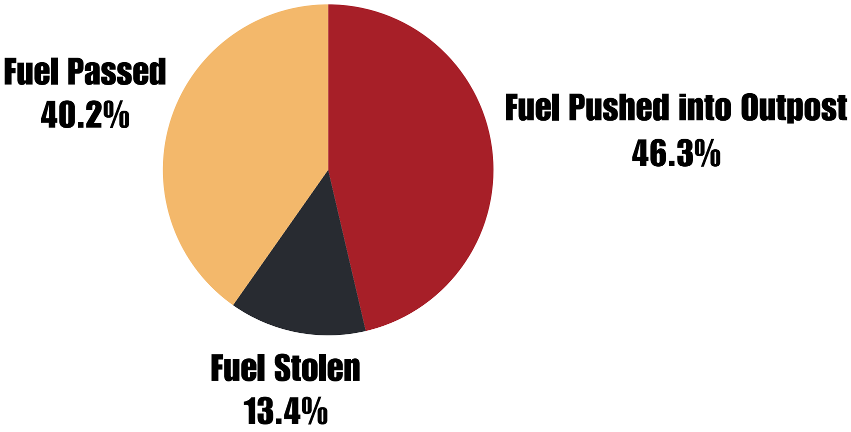
- Quick decision isn't always the best, do more testing
- Manage battery health.
- Its best to go for defence before collecting fuel.
- Test harder than we compete



What we will change:

- Redesign Intake
- Investigate adding an additional camera
- Add more autos

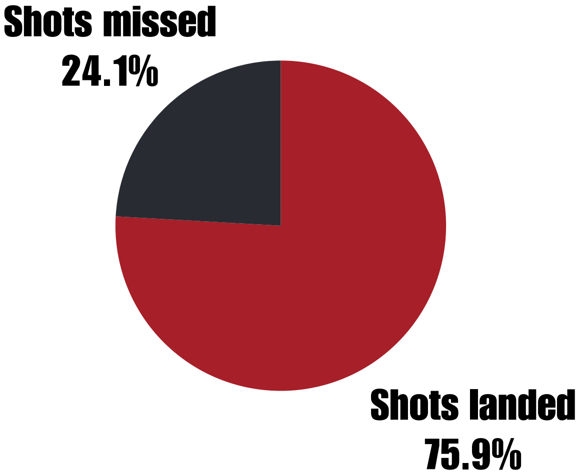
STATISTICS - WATERLOO



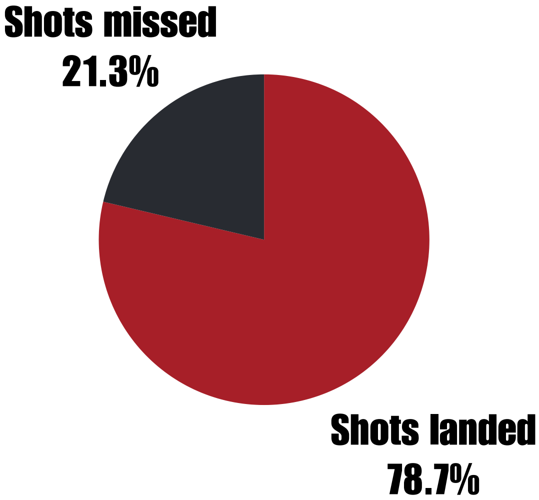
Passing Strategy

Some Strategies that we used heavily throughout the competition were passing to the human player, passing from the neutral zone, and passing from the other alliance zone. In total we passed **455 fuel!**

Robot



Human Player



MECH UPDATES AFTER WATERLOO

- Completely rebuilt Intake, using a new design inspired by the 2609 intake and running on a Kraken X60
- Restructered Hopper to hold more fuel, and mount the camera flat.
- Added a new net that can expand to hold much more fuel than before.
- Adjusted Swerve modules and cableing to accomidate for the Kraken X60 and the New Intake.
- See back of binder for the intake redesign process

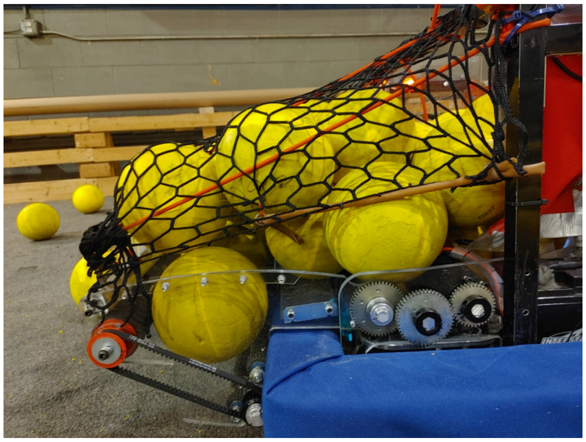
Intake Improvements:

Upgraded to a fast moving Slapdown intake with a large roller, and double powered stub roller kickers. The new design pushes balls not only in, but up into our net, which gives us an extra ~15 fuel capacity.

New Hopper Modifcations

New Intake Side View

New intake top view



Full Net with extra ball capacity

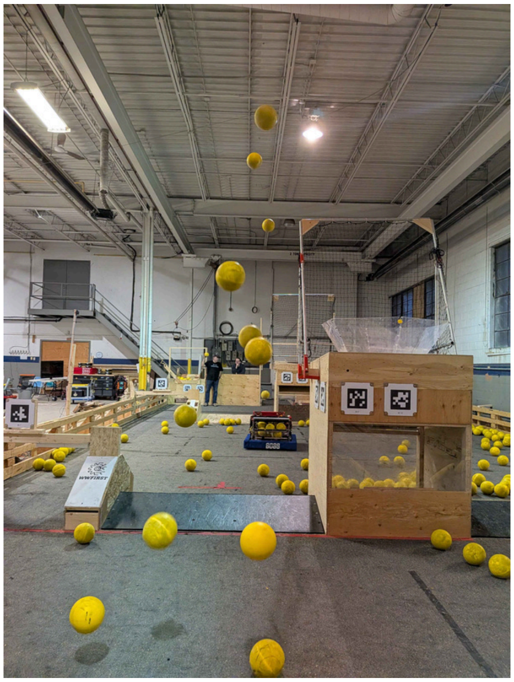
CODE UPDATES AFTER WATERLOO

Improved Magic Trigger!

- Reacts to location on the field to automatically change hood angle and RPM based on targets
  - Feeds to Left or Right side of alliance zone even while moving
  - More accurately aligns to Hub when in our alliance zone

Optimizations

- Retuned shooter and other set-points to increase throughput and accuracy
- Recalibrated cameras for more accurate pose estimation
- Changed code to use a Kraken X60 for intake rollers



Autos

- Increased speed even more into the neutral zone
- High speed intaking to reach neutral zone fast
- Added a Right Auto climb as an option to paths
- Retuned all autos to function with new intake.

Climb

- 3s to climb once aligned
- Added auto-align feature; driver holds button to line-up, releases to cancel
- Functional on both sides of tower

OUR INTAKE, REBUILT™

PRESENTED BY HAAS
Gene Haas Foundation

Durham (1st Event) Learnings

- Linkage is not robust enough to survive competition
- Intake could not keep up with augers/required hopper capacity
- Maintaining ability to retract within bumpers is important, but fuel capacity is too low to support shooter throughput
- More complex to implement than planned

Team Decision

- Other subsytems are robust mechanically, we should focus on intake improvements
- In order to fully achieve our performance goals, we most likely needed a full redesign, which was not possible in the two week turnaround between competitions

13 days between Durham and Waterloo

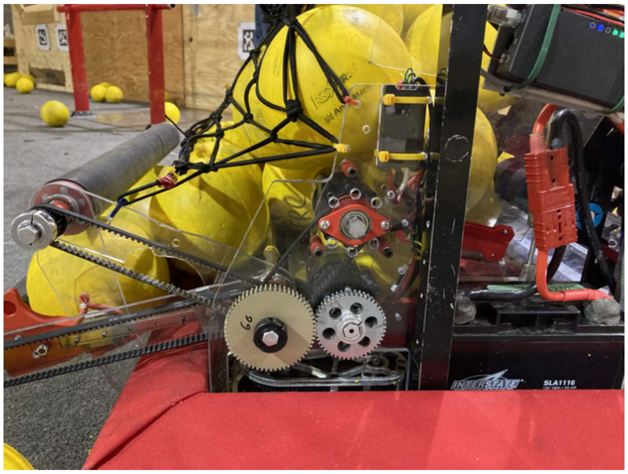
Redesign for DCMP

Intake "Beefing"

Goal: Improve robustness in identified weak spots within the short time period between Durham and Waterloo

Mechanical Improvements:

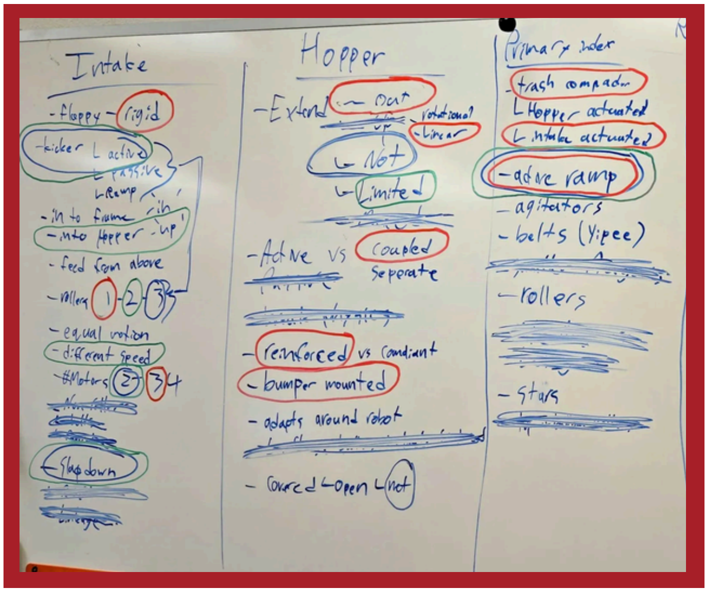
- Replaced 1/4" polycarb mounting plates with 3/8" polycarb plates
- Tied the mounting plates to second location on the chassis
- Added bearing hats to all polycarb holes
- Reinforced mounting tubes
- Printed pulleys out of polycarb instead of PLA
- Added mechanum wheels to sides of front roller to move fuel away from jam points
- Kept changes from Durham:
  - Increased speed of top roller
  - Moved up kicker bar by ~15mm



Redesign for DCMP

1) Requirements and Architecture

- Identified clear requirements
- Brainstormed architectures that could accomplish requirements,
- Looked at designs we saw succeed at competitions



New System Requirements

- Fewer deadspots
- Clearer ball path
- Higher speed and scoring cycle time
- Retain mobility and small format
    - Trench
- Better at depot
- Fold to bumper when holding ~25 fuel
- Designed for wall hits
- Minimal opportunites for penalties
- Fits in the timeline (DCMP)
- Minimal changes to chassis
- Underweight
- Minimize pivot backlash

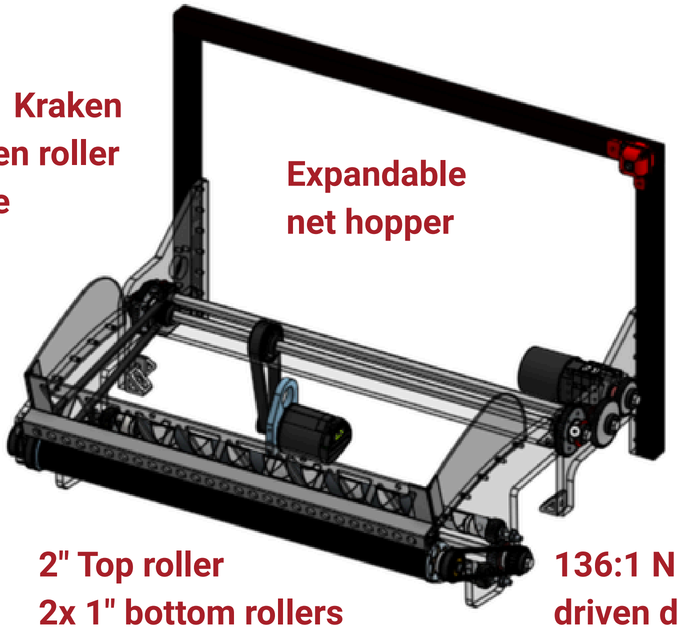
Decision: **Slapdown intake -> Lower complexity, allows re-use of learnings from previous intake**

2) Prototyping

- Minimal prototyping to build on learnings, but be concious of time:
    - How many rollers
    - How much compression

3) CAD

- Organized tasks between students
- Emphasized details, didn't rush



~3:1 Kraken driven roller drive

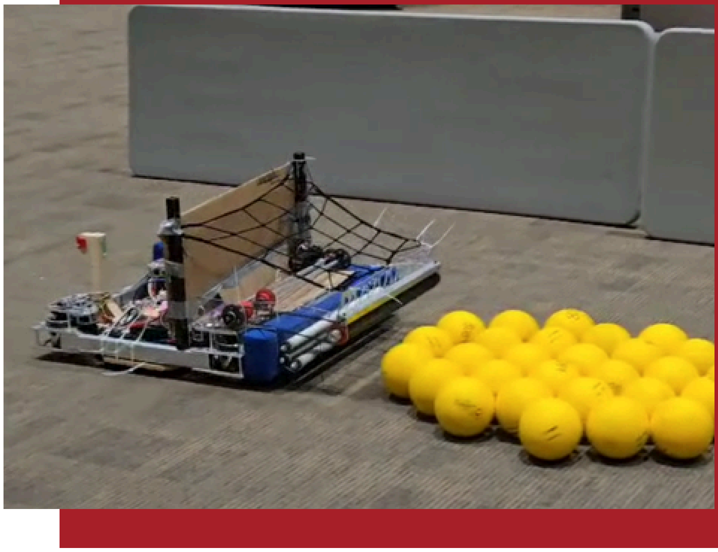
Expandable net hopper

2" Top roller
2x 1" bottom rollers

136:1 Neo driven dead axle pivot

4) Code Base Testing

- Prove the new design works before mounting to the robot.
- Built a full detail prototype on our code base before we touched the old intake
- Tested the design against a long test list that was written to include all of our requirements
- Tested intaking while moving, against walls, with different clumps of balls, and hopper packing to prove that the new design improved upon the previous meaningfully



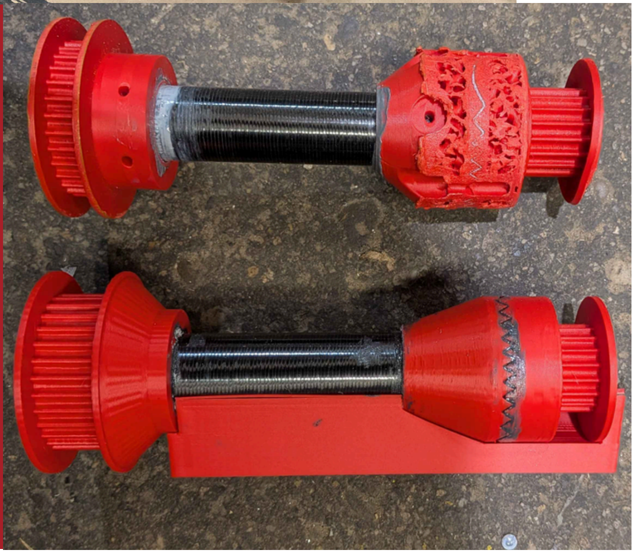
5) Assembly and Iteration

- Our thorough CAD led to a smooth swap from the code base to the full robot
- Intentional planning around the mounting of the new intake let us reuse 80% of our robots hopper structure
- We went through multiple iterations of our ‘torque tube’ which was a deadaxle roller that let us belt our intake from a Kraken x60 tucked into our frame
- The torque tube used a carbon fibre shaft epoxied to 3D printed pulleys
- The required alignment and multiple 3D printed tolerances made assembly challenging so we moved to a more robust solution
- With our Intake arms deadaxled on the coaxial shaft we were able to use regular metal pulleys which is much more robust.

Torque tube V1:

↓

Torque tube V2 with assembly jig:



PROVINCIAL CHAMPS RECAP

How We Did

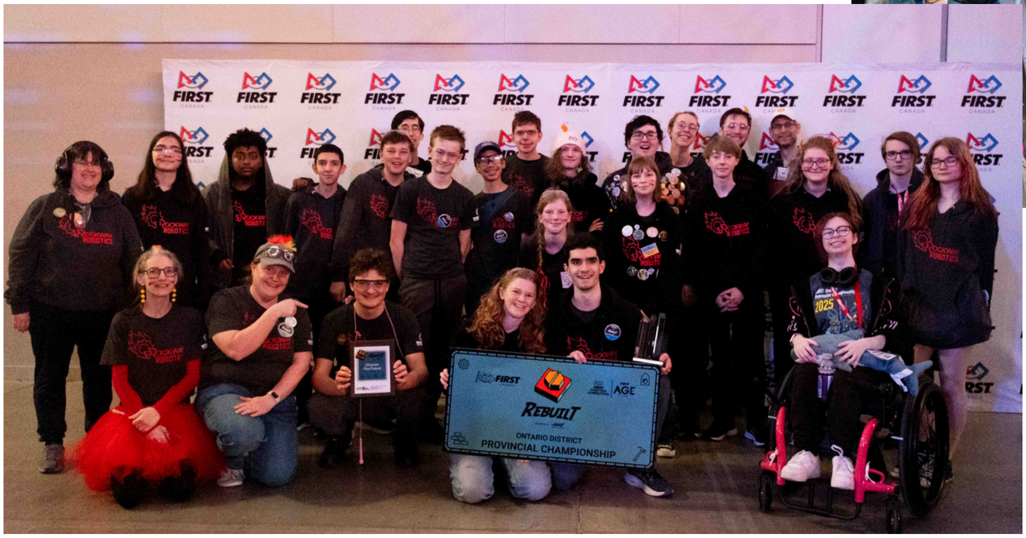
Award: Innovation in Control

Ranking: 17

Joined Alliance 8

What we learned:

- Cameras should be better protected, and having a second back-up camera is worth it
- Robust mechanisms make gameplay easier
- Easily changable autonomous routines are a benefit



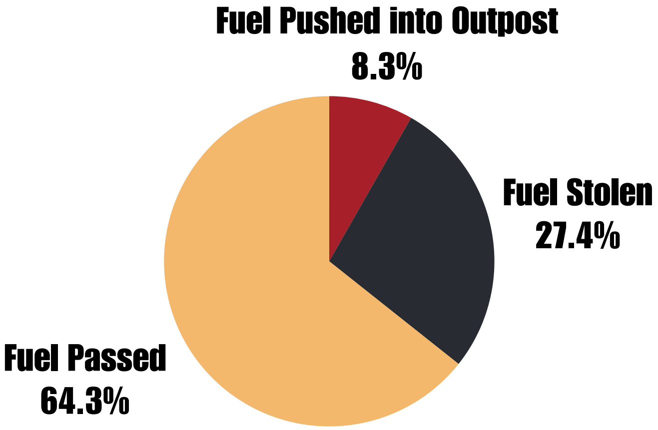
STATISTICS - PROVINCIAL CHAMPS

Increased Fuel Scoring

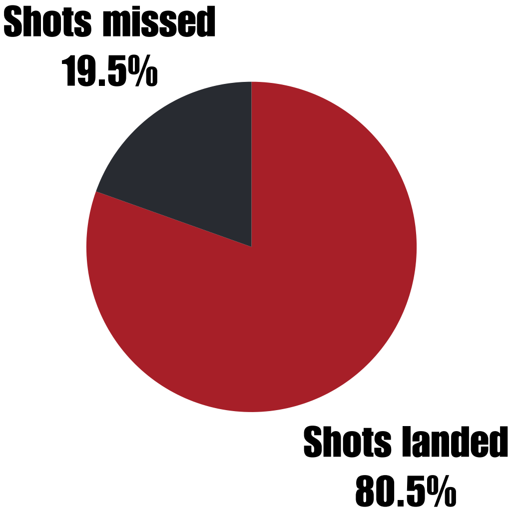
With the upgrades to our intake we were able to pick up significantly more fuel per match.

We also had lots of drive practise leading up to Provincials, meaning our drivers were able to zip around the field more efficiently, so we could do more per match.

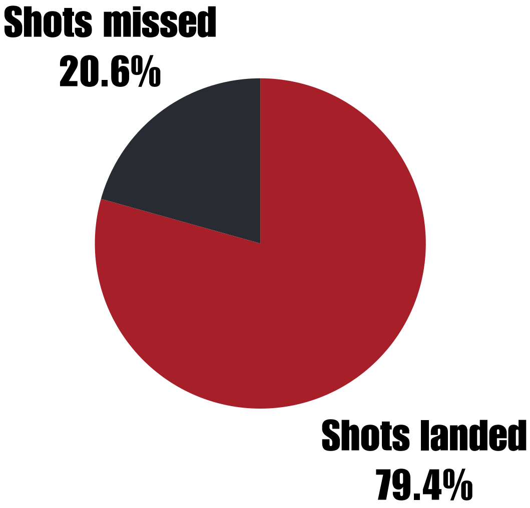
In total, we scored **1815 fuel and passed 412 fuel!**



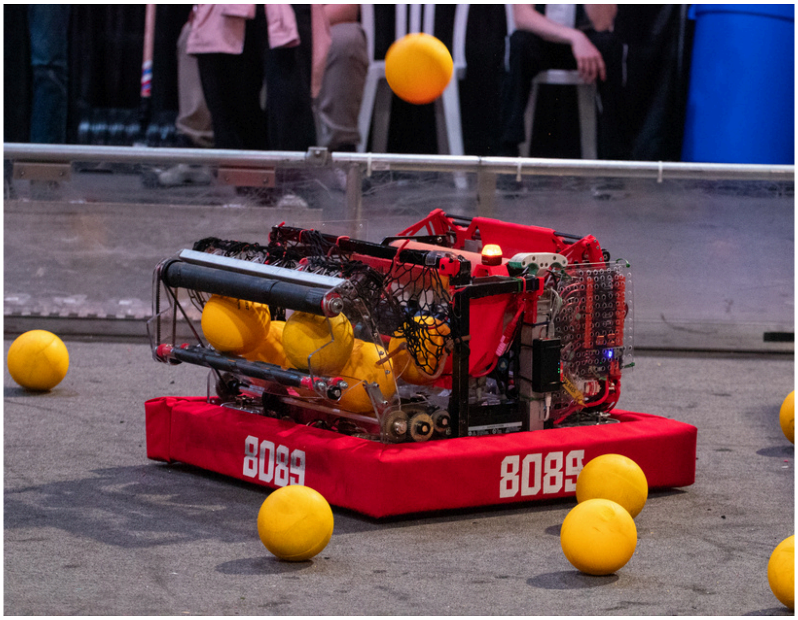
Robot



Human Player



SEASON RECAP
2026: REBUILT STATISTICS



	2025	2026
District Ranking	41	33
Awards Won	Team Spirit, Judges, Judges	Imagery, Team Spirit, Innovation in Control
Win-Loss-Tie	19-33-0	23-21-0

Each competition, we were able to score more and more fuel as we iterated and improved our robot throughout the season.

We improved our ranking in Ontario by 8, and for the first time ever had more wins than losses - our most succcessful season yet!