<10355 Project Peacock>

Engineering Design Portfolio 2024-2025

10th Anniversary Season

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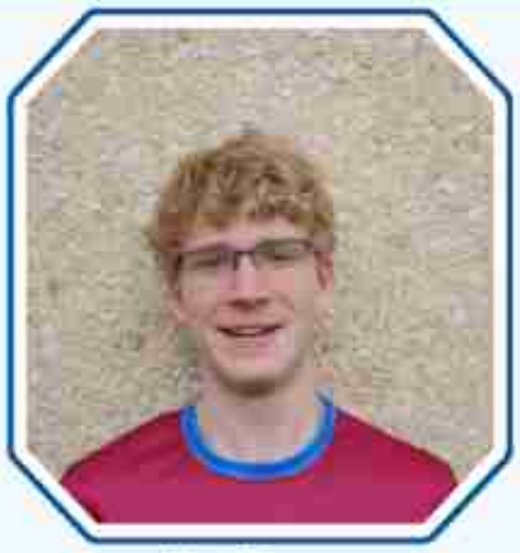
<meet the Team>

<mission Statement>

We compete in robotics to inspire our peers around the globe to be passionate about STEM, have an opportunity to get hands on experience with all aspects of FIRST, and to have fun!

Andrew
3 Years
Team Captain, Mechanical, Drive Team
Proudest Moment:
Helping the team come together

Hope
4 Years
Communiations & Social Media
Proudest Moment:
Participating in goBilda's Ri3D



Anthony
4 Years
Drive Team & Software
Proudest Moment:
Learning everything to program the bot

Jaxon
4 Years
Lead Designer & Drive Team
Proudest Moment:
Designing both the robots

Amelia
3 years
Human Player
Proudest Moment:
Challenging my limiting beliefs

Luke
New to the Team!
Software
Proudest Moment:
Enhancing driver controls

Eli
New to the team!
Software
Proudest Moment:
Being human player at a Arkansas Qualifer

Jace
New to the team!
Mechanical
Proudest Moment:
Succeeded in learning coding

Rori
2 years
Portfolio, Mechanical
Proudest Moment:
Designing the portfolio from scratch

Ri3D2
New to the team!
Proudest Moment:
Being a universal kit bot!

Amphirite
New to the team!
Proudest Moment:
Winning Oklahoma Regional Qualifier!

<Team Leadership>

- Entirely youth-led
- Mentor supported
- Annual leadership workshops

-Currently, we have 2 Eagle Scouts on the team, but we have had many over the years

<fundraising & Sustainablity>

<team Branding>

We've experimented over the past few seasons with alternate color schemes, but we always come back our iconic logo & unique colors!
You can see us on the field with our maroon cowboy hats and peacock feathers!
We always start our matches with our distinctive "PA-KAW"

<team Introduction>

Project Peacock is a **community based** team from Tulsa, Oklahoma in our 10th season, and the original of the four teams in STEAM Post 26. We strive to improve awareness of FIRST and spread its **core values** in our community in everything we do.

<seasonHighlights>

Hosting STEM summer camps

Participated in the Chicago Robotics Invitational in July

Beta tested pre-release goBilda products (GripForce Mecanum Wheels, PinPoint, goBilda Battery Health Analyzer, new Odometry Pods, camera mounts)

Was selected to participate in the goBilda Robot in 3 days (over 15k views)

FUN Behind the Bot

Ranked #27 in the FUN Top 50 in the World

3 Int'l Outreach Online events w/Romania

Lots of community outreach!

Ranked #1 Team in the May League

Competed at the Mountain Home, AR Qualifier was the Winning Alliance Captain and Motivate Award Winner

Oklahoma Regional Winning Alliance Captain

Arkansas Regional Winning Alliance 1st Pick

<team Goals>

Season Goal	Plans and Steps Taken
Advance to Worlds in 2025	• Spoke with previous Inspire Award winners to learn how to structure portfolio and presentation • Continually improving our robot, outreach, and documentation
Increase Our Member's Skills	• Led **classes** in CAD and participated in CAD challenges • New members built the prototype chassis • New members work with existing members to learn both hardware and software skills • Basic Safety & Skills Certification courses offered in the Google Classroom
HAVE FUN!	• Held parties, **team building** exercises, and local scrimmages
Long Term Goals	**Steps to take**
Improve Team Stability	• Hold regular open houses for **recruitment** for FTC, FLL, and FRC • Create resources for new team members to learn new skills
Spread First Globally	• Hold **outreach** events to spread awareness of FIRST • Create resources for schools/teams to use to start new teams • Participate in scrimmages to **connect** with different communities • Help other teams in the online community via Discord • Continue to cultivate relationships with teams across the world to better understand each other!

<fundraising and Sustainability>

<sustainability Plan>

To make 10355 a strong team and ambassador for FIRST for generations to come, we need to:

- Elect and train new leaders before seniors graduate
- Pass down skills through classes and hands-on experience
- Make sure every person on the team has a leadership role in a subteam

- Keep team 10 members strong (we've learned this is the sweet spot)
- Assist FLL teams to have a flow of new members from FLL graduates
- Hold open houses and outreach events

- Continue to open the Tulsa Robotics Center to the community
- Share our passion and experience with those unfamiliar with STEAM through summer camps & team development workshops
- Take advantage of new opportunities to give back to the community
- **SHARE FIRST WITH MORE NON-STEAM ORGANIZATIONS/ PEOPLE**

<swot Analysis>

Strenghts

- Numerous connections with the engineering community
- 19 years of collective FTC experience with multiple Dean's List Finalists
- Strong mentor support team with over 48 years of FTC experience
- Diverse skill set and interests
- The Tulsa Robotics Center

Weakness

- Communication
- Time management skills
- Tendency to be messy
- Scheduling building + programming with drive practice

Oportunities

- Continue to expand skills
- Large potential for networking with teams through the FTC Community

Threats

- Not recruiting enough to continue
- Could lose our space at the TRC
- FRC could impact team dynamics

<fundraising & Sponsorship

Looking at our team plan, we recognized the need for ongoing fundraising and sponsorship to achieve our goals.

It is only through the generosity of these sponsors year after year that we are able to build a custom robot and travel out of state to complete at events like Worlds, CRI, and Arkansas.

This season, we obtained a grant through the Gene Hass Foundation.

Gene Haas Foundation

We are also sponsored by Polymaker. They have graciously provided our team with different 3D printing materials to build our custom bot.

Donations	Expenses	Revenue
$18,367.79	$6738.91	$11,628.88

<how we connect with Mentors>

<how we learn From Mentors>

Mr. Smith's leadership and dedication to our program is inspiring. Mr. Griffin is always there to consult for programming. Mr. Pollard & Mr. Sullivan are happy to give suggestions on design simplicity & reliability in a calm manner. Mrs. Griffin teaches us how to manage our money throughout the season. Jameson is always available to teach machining & assembly. Mrs. Hall is quick to take pictures for us, and Mrs. Pollard helps keep us on track and calm!

Each of our mentors share their love & their talents with us in their own way.

<our Mentors>

Our many mentors teach us skills in design, manufacturing, programming, finance, public speaking, and more!

Several of them are *professional engineers, work in a STEM field, or are FIRST Alumni.*

Mr. Smith
Programming /Mechanical

Mr. Pollard
Manufacturing /Mechanical

Mr. Sullivan
Mechanical

Jameson
Machining

Mr. Griffin
Programming

Kevin
Programming /Portfolio

Mr. Hayes
Quartermaster

Mrs. Pollard
Official Cat Herder aka. Team Mgmt

Mrs. Griffin
Team Management

Mrs. Hall
Team Photographer

<how we Connect with Engineers>

- Touring Amazon we learned how they use robots in their work at the distribution center
- Berry Aviation taught us about drone technology
- goBilda asked us to test new products before they were released

<why we value Connecting>

Connections with engineers allow us to broaden our resources, learn more about STEM, and enables us to share about FIRST, which is part of team's mission statement! Inviting people from the community to visit and share the Tulsa Robotics Center facility helps us to continue these connections! This is how we partnered with Advanced Plastics and J&M Manufacturing who cut our side plates for us. They will be teaching us about the manufacturing process in house.

<outreach Timeline>

June Open House
-80+ people in attendence

-Gave tours of the Tulsa Robotics Center to local business owners and families

Lesson Learned: We are very blessed to have the space at the TRC to work in.

June & July TRC Summer Camp
-60 kids in attendence

-Planned and ran 3 weeklong summer camps for youth!

Lesson Learned: There are kids with all kinds of challenges, and we need to be kind and patient when working with them.

August Co Teach FTC 101 for Mentors
-8 mentors in attendence

-Helped teach FTC basic course for mentors, highlighting how they can best help their youth.

Lesson Learned: youth can teach adults just as much as they can teach us!

August Twisted Trails Duathlon
-80+ people in attendence

-Team members checked in participants, managed the parking lot, and kept time where proceeds went to a local cancer patient.

Lesson Learned: non-stem outreach leads to knew connections and opportunities to serve good causes.

August FC Tulsa Outdoor Soccer
-100+ people in attendence

-Team members volunteered to talk to the public about FIRST

Lesson Learned: Not all outreach events have people who want to learn about FIRST.

September FTC Kickoff Class
-30+ guests attended

-Team members taught FTC 101 class at Into the Deep Kickoff.

Lesson Learned: Experienced teams have a lot to offer rookie teams.

June Tulsa Sporting Events
-800+ people taught about FIRST

-Team members volunteered to talk to the public about FIRST

Lesson Learned: If you make a Minion robot, it gets people to come to your booth

July CRI
-38 Teams in attendance

-Competed with AI Citizens as their 1st Alliance Partner

Lesson Learned: Keeping up relationships with teams has unexpected returns.

August Tulsa Drillers Baseball Game
-5000+ people in attendence

-Team members volunteered to talk to the public about FIRST

Lesson Learned: Baseball and robots are a fun combo!

August Tulsa Maker Faire
-1,000+ people reached

-Team members held a robot demonstration and shared more about the Tulsa Robotics Center

Lesson Learned: attending outreach events can result in new members!

September goBilda Robot in 3 Days
-37,900+ veiwers

-Accepted invitation from goBilda
-Built a robot in 3 days while live streaming

Lesson Learned: Live streaming is fun and exhuausting!

September Tinker Fest
-11,163 guests attended

-The team participated in the Tinkerfest scrimmage.

Lesson Learned: Our design made an effective early robot.

<outreach Timeline>

November Interview with Romanian FTC Team 19044 Peppers

-Co-interviewed with Peppers
-Explored cultural and regional differences and similarities
Lesson Learned: It is invaluable to understand the difference in cultures to continue Gracious Professionalism!

November Co-Hosted Black Friday Scrimmage

-10 Teams
-We helped host a scrimmage at the Tulsa Robotics Center where teams from Arkansas and Western Oklahoma came to compete.
Lesson Learned: Competing can be very relaxed and a lot of fun, especially with new teams!

December Hanging with the Romanian Heart of RoBots Team # 20265

-Shared experiences and skills with team 20265 Heart of RoBots through discord that can be shared to our prospective communities.
Lesson Learned: Collaborating with a team across the world is a lot of fun and beneficial in many ways!

December Enryngo Urbanism Youtube Channel Collab

-600+ views
-Team members interviewed to create a video about FTC and its impact on the community.
Lesson Learned: There are a lot of really great things about STEAM Post 26 and its teams!

February Co-Hosted Super Bowl Scrimmage

-9 teams competed
-We helped host a scrimmage and Super Bowl party at the Tulsa Robotics Center where teams from Arkansas and Western Oklahoma came to complete
Lesson Learned: Helping fellow teams prepare for the State Competitions feels good!

February University of Scouting

-100 people in attendance
-Promoted programs that help leaders enhance their units and have more activities to help teach the kids.
Lesson Learned: Not knowing how much space we have effects how much we are able to do and bring.

February RoSophia Inspire Around the Globe

-12+ teams
-Shared experiences, design process, and strategies with teams around the globe
Lesson Learned: Inspring others around the world helps us fulfill our team mission!

Ongoing Oklahoma and National FTC Discord Servers

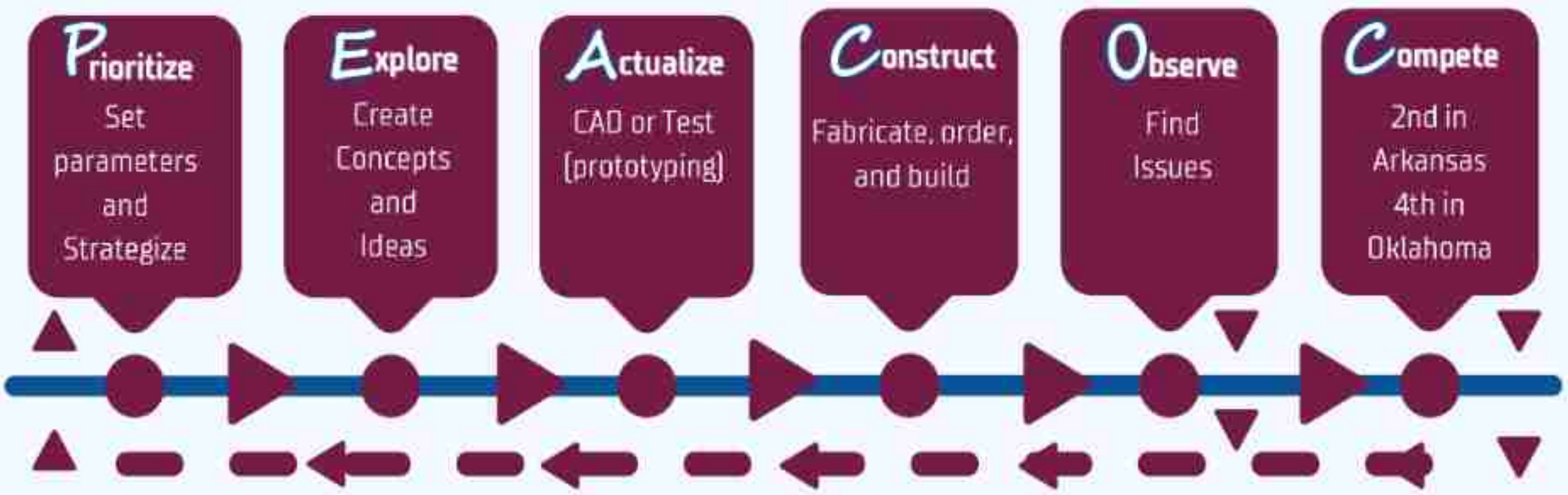
We constantly connect with a community of **20,000** FTC members, Alumni, and mentors from around the world, while also mentoring teams like 4155, 21980, & 10354, and are currently working to support teams in Kazakhstan.
Lesson Learned: Sharing ideas can be beneficial to everyone involved.

17+	2,500+	80,000+
Outreach Events	Hours Served	People Impacted

<peacock design Process>

Our design process begins with brainstorming ideas to carry out the tasks necessary for the season, then making CAD models, and finally building them to test out as many as possible. We then look at the design and what might need improvement and start the process over again. As a team, we believe that our robot can always be better; we continuously look for ways to improve it, often holding design reviews to get the entire team's and mentor's opinions.

<design process Flowchart>



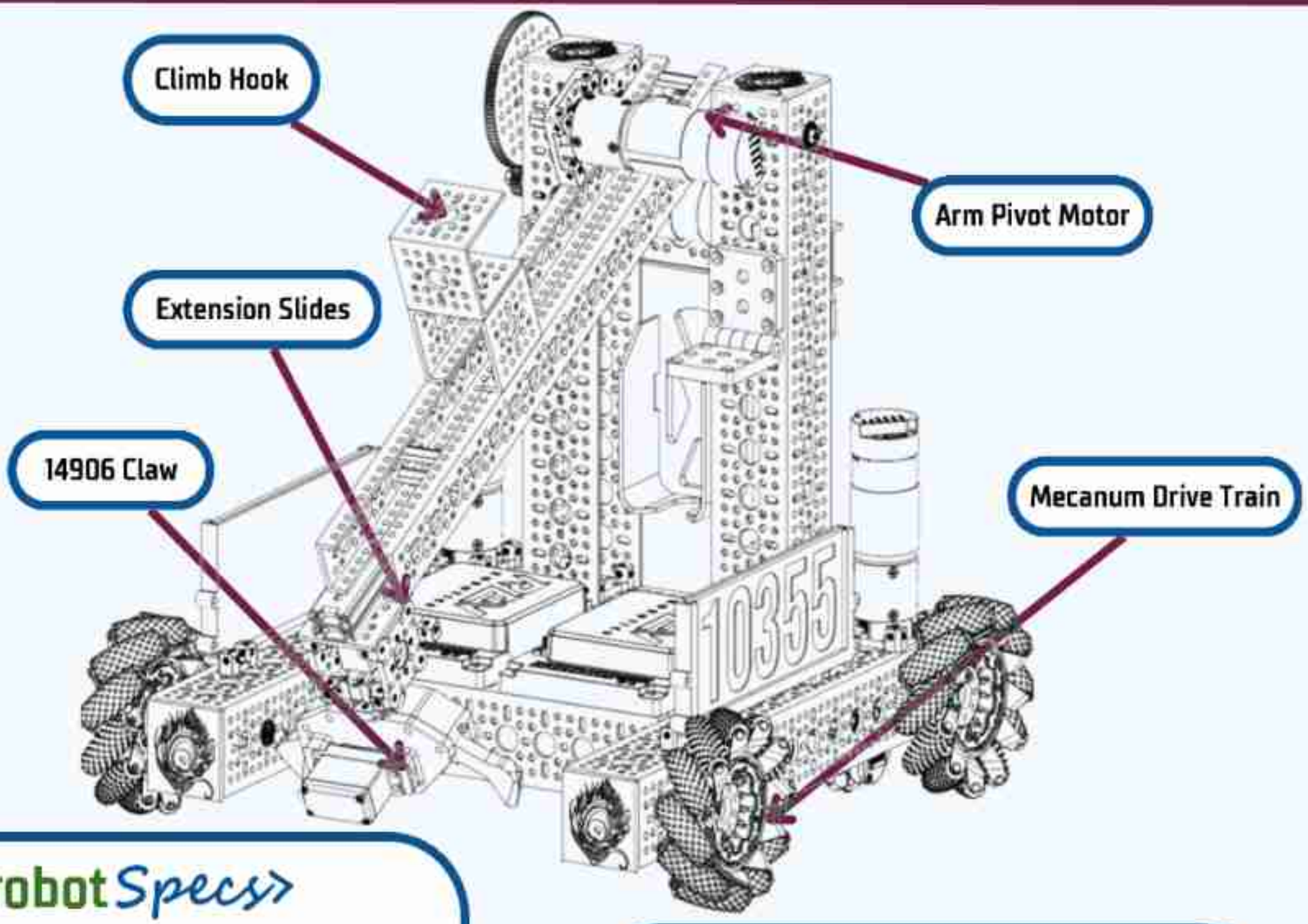
<design Review Outcomes>

- Had a few missing functional things including a battery mount, team signs, and a power switch.
- Found new ways to continue to improve and optimize our mechanisms and robot as a whole.
- Discussed possible issues and failure points within the robot and its mechanisms.

<lessons Learned>

- Creating the plan for level 3 ascent is going to be more difficult than originally thought
- Having the robot's weight balanced is key for staying upright!
- Setting up the goBilda PinPoint was difficult. Once the issue was located, it was incredibly easy to use!
- It was easy to drop samples into the robot during teleop. We needed to create a shield to keep samples from being trapped in the robot, which would take us out for the rest of the match.
- Mentors are an invaluable resource

<V1 robot Design>



<robot Specs>

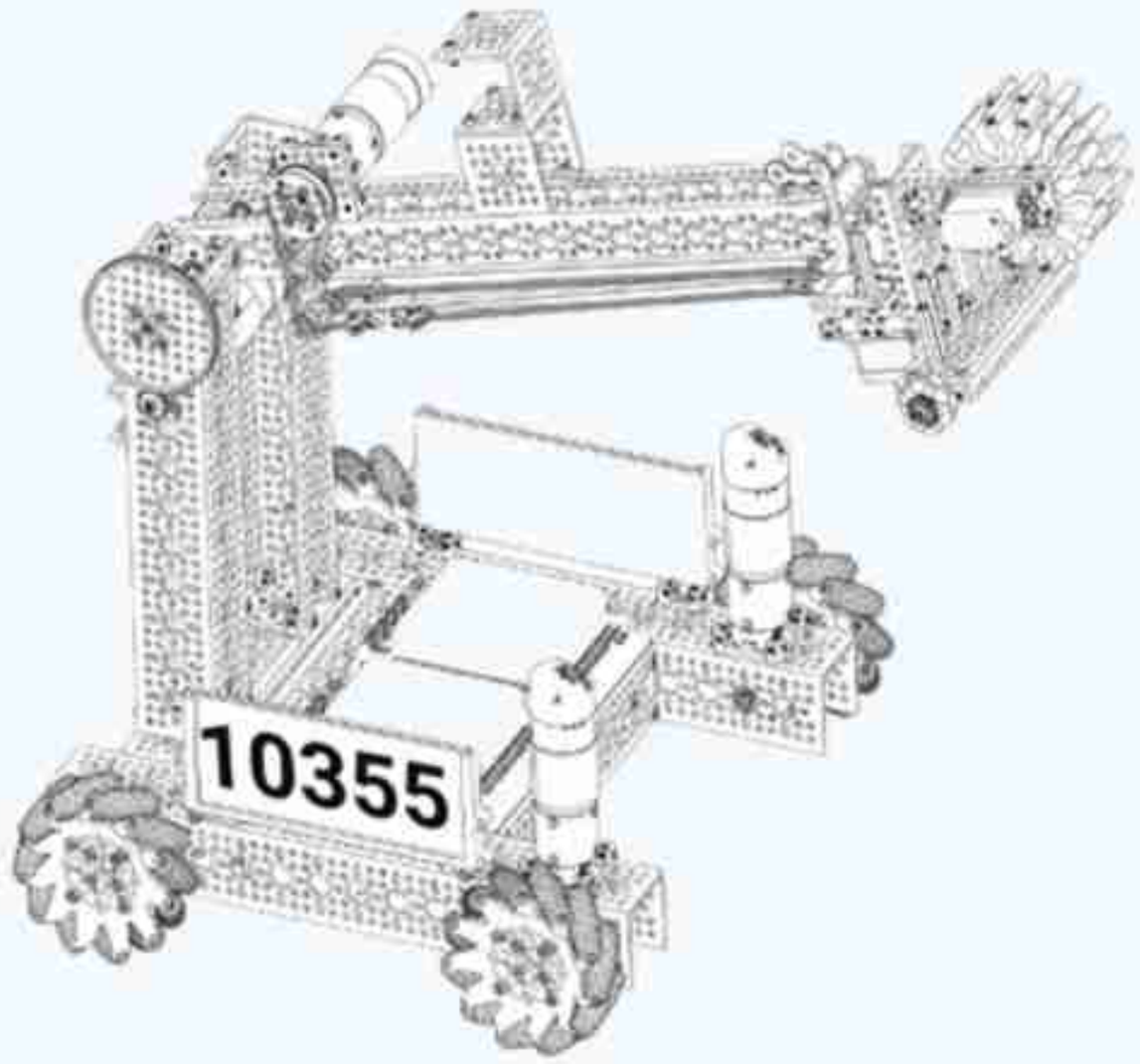
- 435 RPM Mecanum Drive Train
- Pivoting Arm
- Double Stage Belted Viper Slides
- Level 2 Ascent
- Using the new GripForce Mechanum wheels
- Robot weight w/ REV Hub = 13.52 lbs

<open Source>

The 10355 Kit bot can be purchased from goBilda's website. They have added the CAD and programming files as well, so any team can have a successful start of the season!

<ourWhy>

- Project Peacock & goBilda's Robot in 3 Days *Into the Deep* robot was designed so that rookie teams could build it with ease
- We wanted to encourage teams that a competition robot could be made from COTS parts and does not have to be custom.



<robot Strategy>

- Autonomous: scoring 4 in the high basket.
- Teleop: rapid scoring in the high basket ~12
- End Game: L2 assent
- OPR of 135

<challenges>

- Cannot do L3 ascent
- Not optimized for specimen

goBILDA
DREAM • MAKE • REPEAT

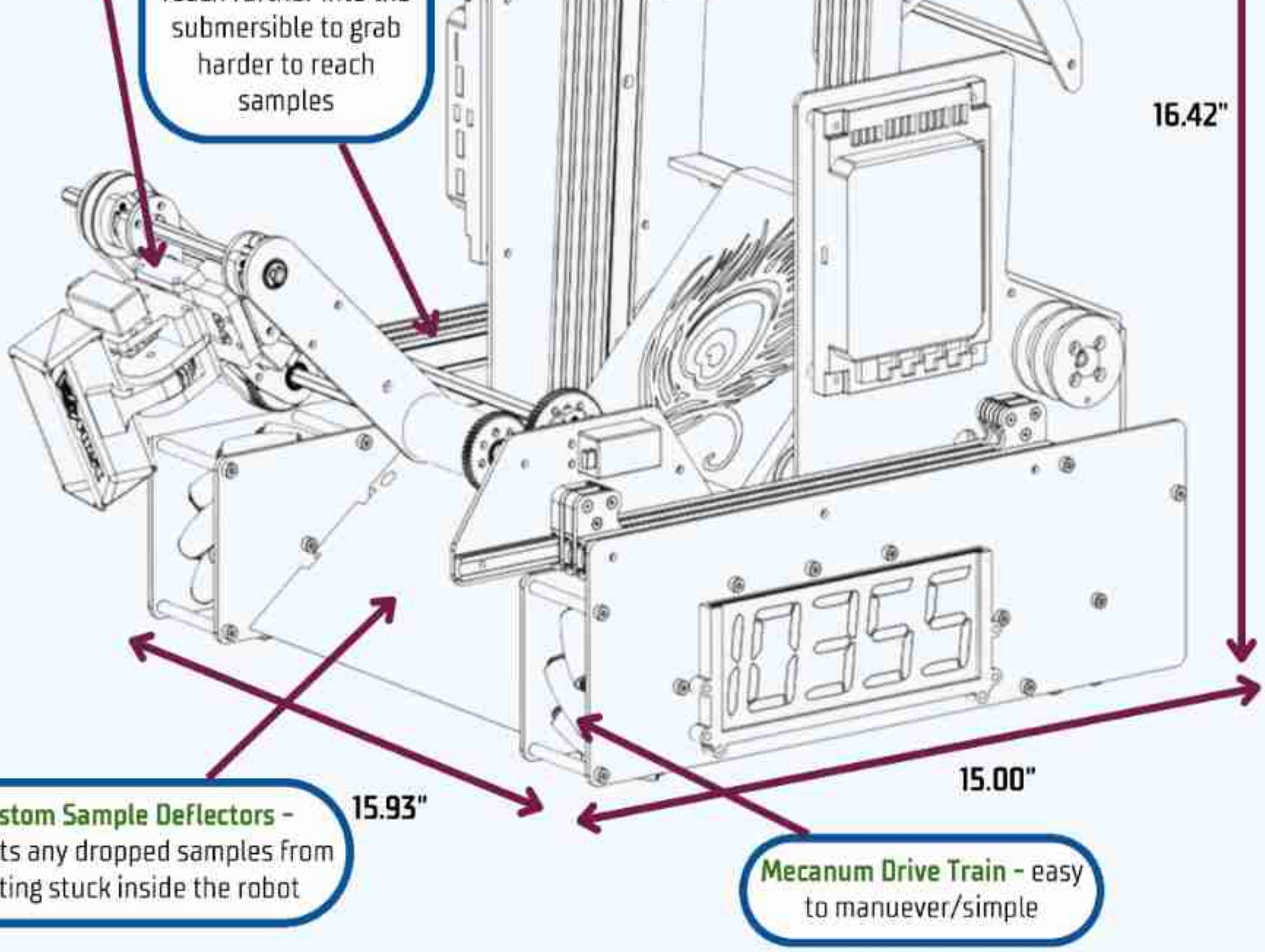
<V2 robot Design>

Outtake Claw and Extension – dual linear slides, simple and effective. To score samples in the high basket and specimens in the high chamber.

Climb Hook – to climb onto the second bar getting a level 2 ascent.

Intake Claw with Wrist – to pick up the samples from any orientation.

Extension Slides – to reach further into the submersible to grab harder to reach samples



Custom Sample Deflectors – deflects any dropped samples from getting stuck inside the robot

Mecanum Drive Train – easy to manuever/simple

<game strategy + Key Design Points>

Needed Design Elements:

- Small, fast drivetrain
- Stable, rigid lift for climbing and scoring
- Secure grip on Samples
- Max extension limit for longer reach
- Able to pick up samples and specimens quickly
- Dual sided alliance markers for quick change of alliance colors
- A quick and accurate transfer mechanism
- Able to pick samples up from all directions
- Quick and reliable extension
- Fast and strong lift for scoring and climbing

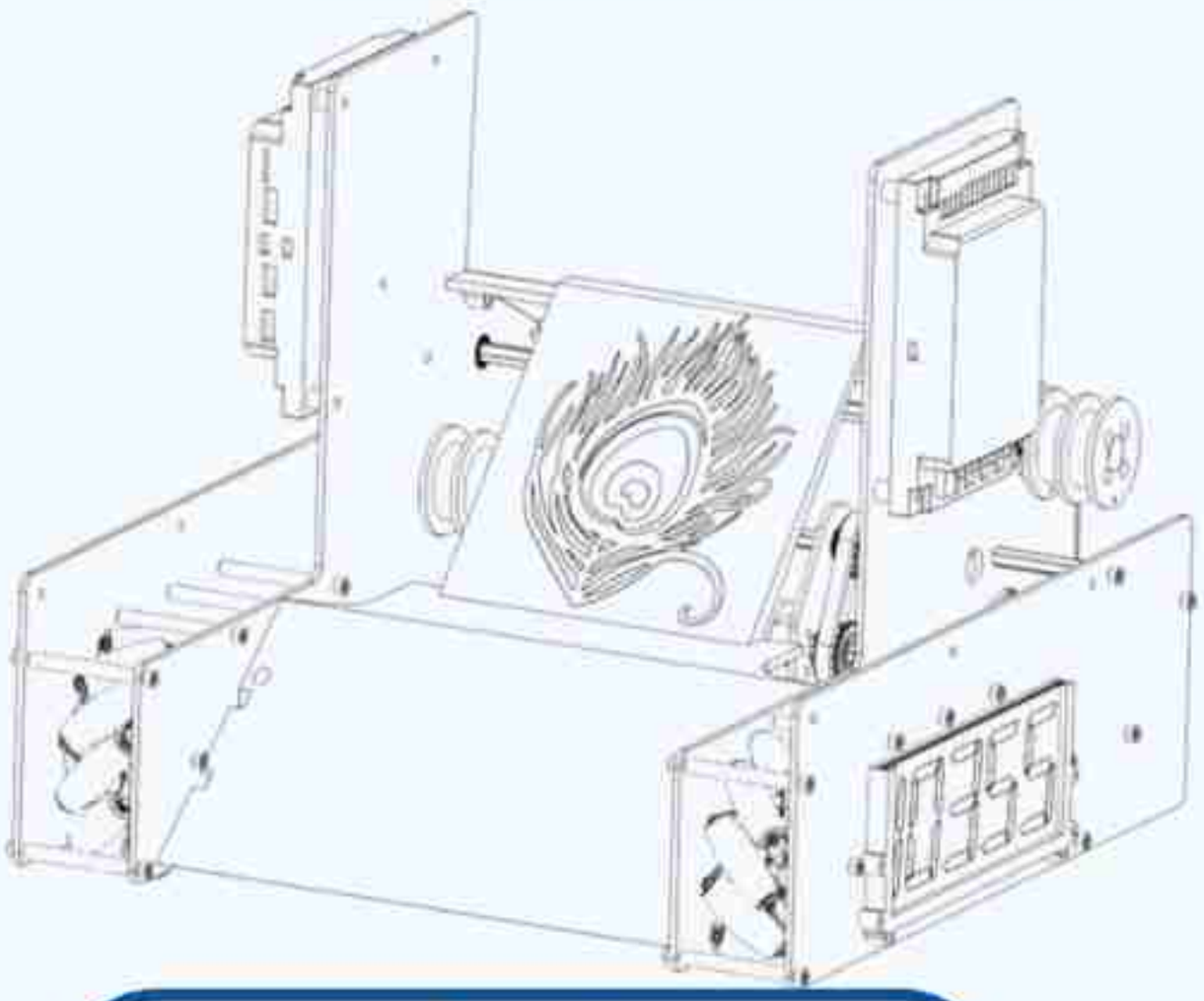
<V2 chassis Design>

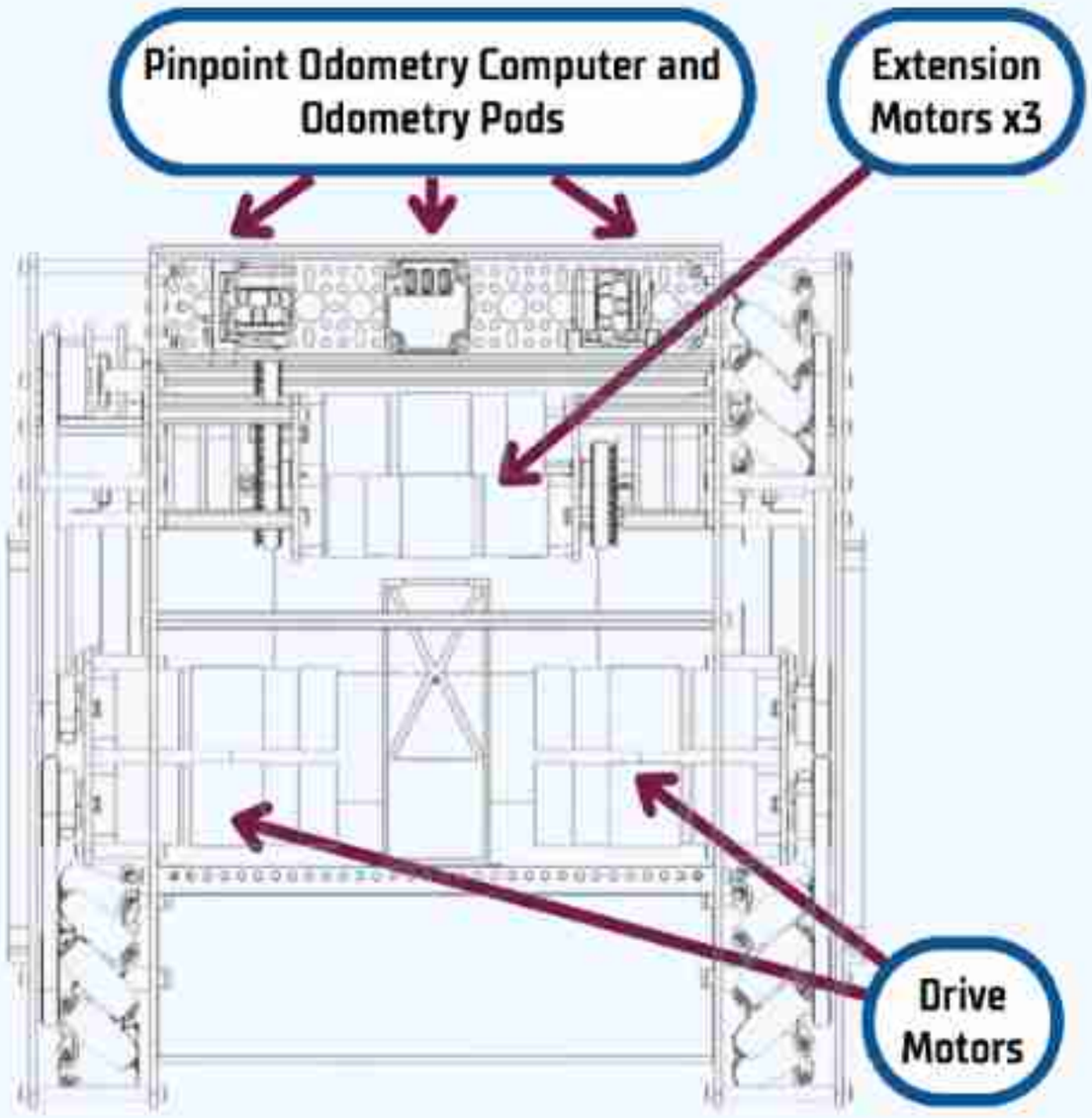
<quick Stats>

- 15in x 15.9 external dimensions
- 4 motor Mecanum drive
- 13.7:1 drive ratio
- 2 wheel odometry + odometry computer
- 6061 aluminum construction

<custom Manufacturing>

- The drivetrain has over 50 custom-manufactured parts. These give us the freedom to make the robot to the exact specifications we've calculated.



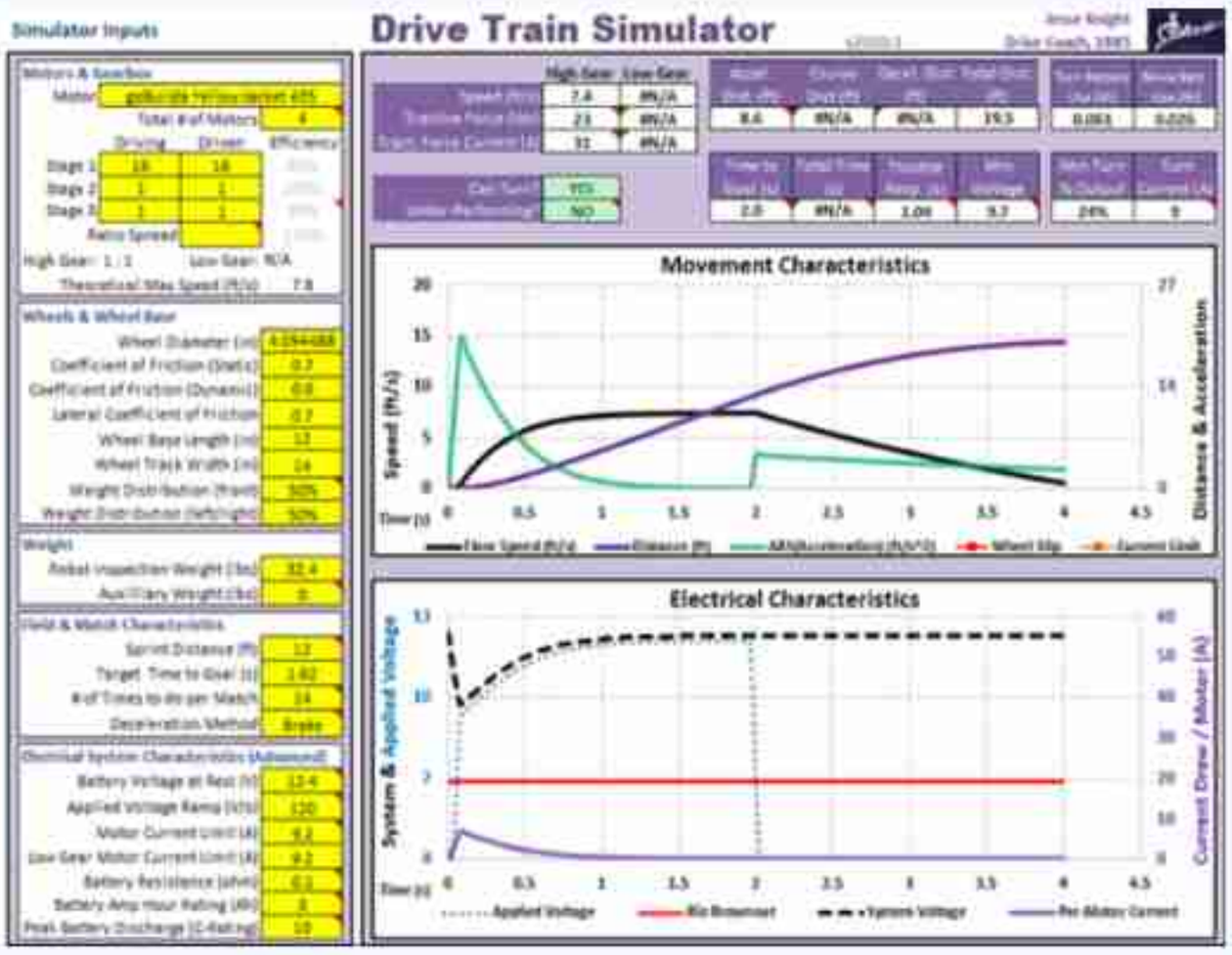


Specs>

- 435 RPM Mecanum Drive Train
- Intake and Outake 4Bars
- Horizontal and Vertical Extensions
- Level 2 Ascent
- Dual Sided Team Signs
- Using the new GripForce Mechanum wheels

<why did we Build a New Robot?>

- The V1 Robot in 3 Days robot was limiting on how we wanted to approach this year's game.
- Learning where we can improve based on the V1 performance, we designed a custom robot to have what we lacked on the first design.
- The V2 robot is faster and more consistent in both scoring and driving, therefore meeting our team's game objectives.



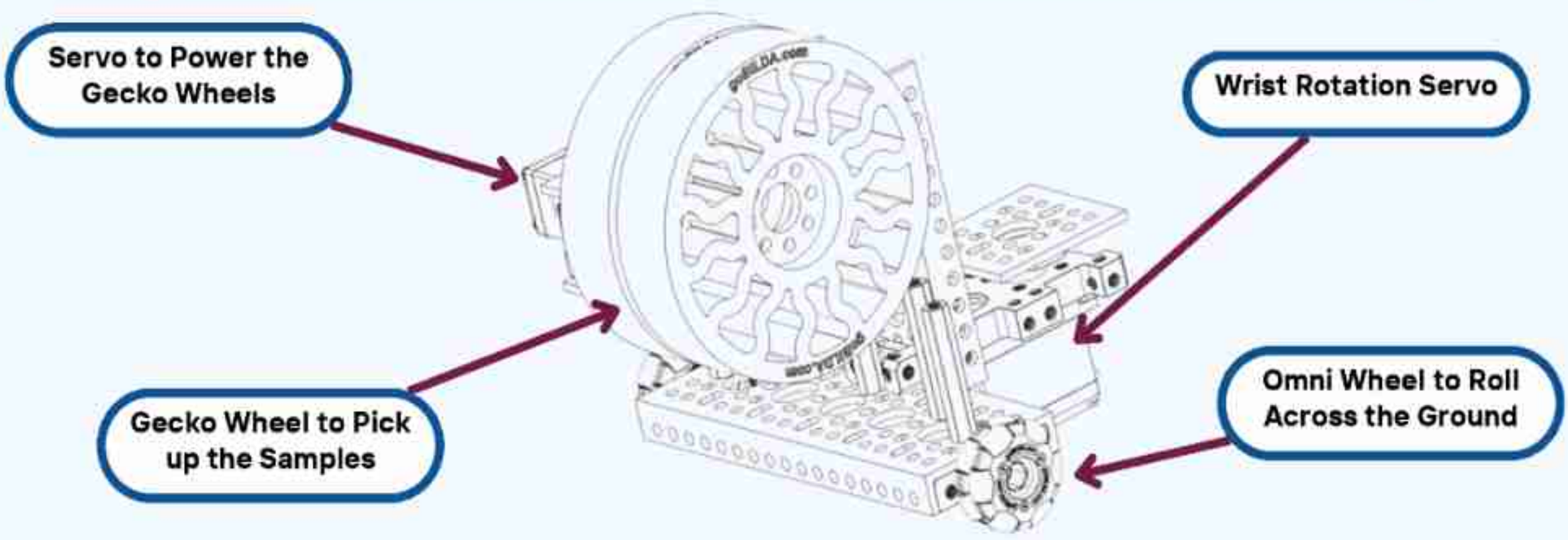
<lessons learned from Previous Robots>

- Grabbing out the front and scoring out the back will speed up cycle times for scoring
- Picking up specimens off the wall is easier than off of the ground
- Long claw fingers are ideal
- DON'T FALL OVER!! - previous robot had a tendency to tip over when we went too fast

<intake Design>

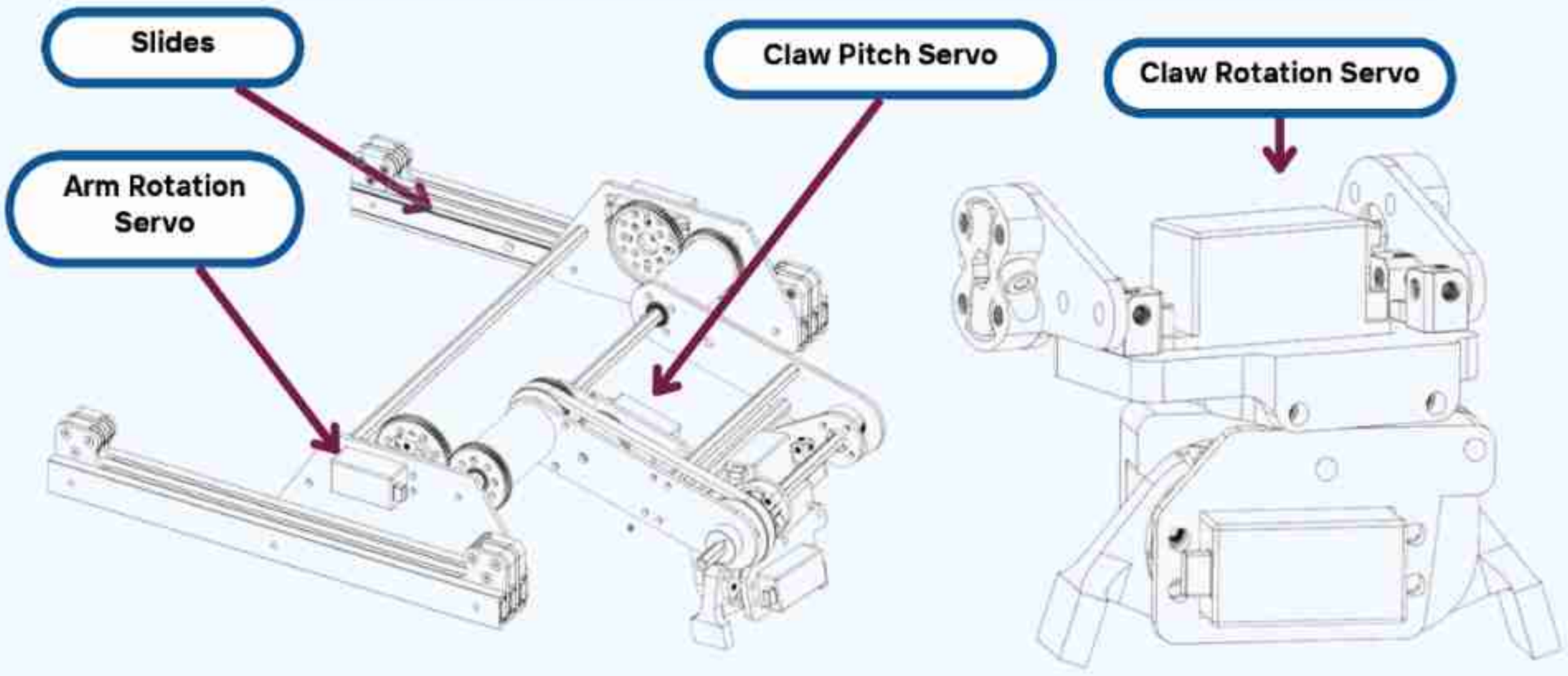
<active Intake Features>

- A constantly spinning grippy wheel to pick up the samples
- Only 2 degrees of freedom
- Has a servo to rotate the mechanism
- 2 omni wheels on the sides to help it roll on the ground



<passive Intake Features>

- 3 sets of Misumi SAR230s [light, fast, and simple] driven by strings
- 3 degree of freedom arm
- Custom Designed Claw - which can rotate 90 degrees
- Custom 3D printed inserts for the slides and spacers



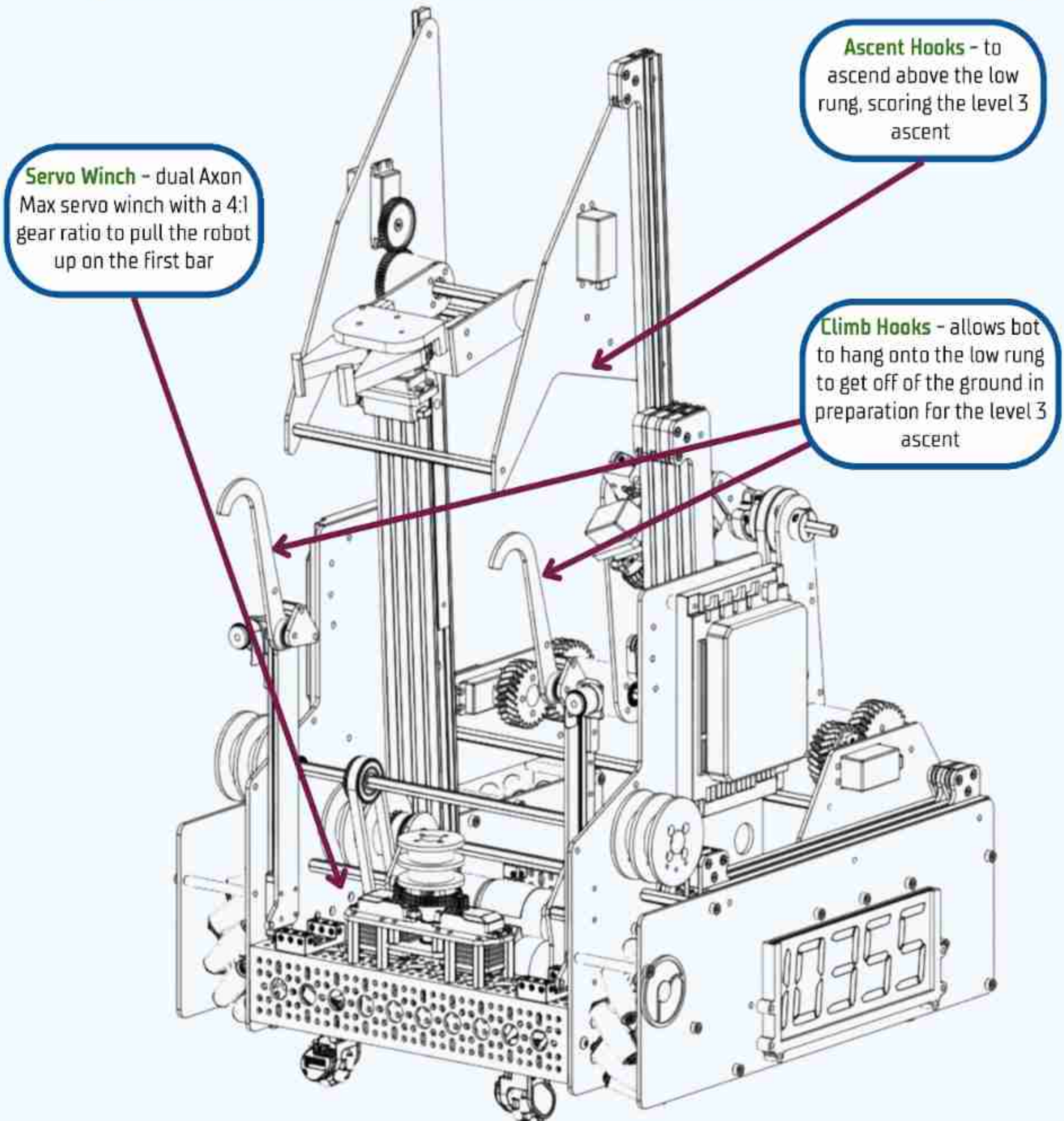
<lessons Learned>

- Passive intake was more accurate and requires a more precise driver
- Passive intake is more compact and reliable, but the active intake is more durable
- Even though the passive intake is more fragile and has more moving parts, it will enable us to be faster when scoring

<V3 robot Design>

<robot Modifications>

- The robot needed to be lighter to be faster
  - Changed to carbon fiber side plates, which saved 4lbs
  - Increased cycle times
  - Faster cycles enabled different autonomous programs
- We wanted to do the level 3 ascent:.
  - Added physical climbing hooks
  - Passive hooks powered by a winch to pull the bot off of the ground
  - Added a third 435 rpm motor to the lift to have enough torque to pull above the low rung
- Increased the flange size on string pulley's to have less issues with it unspooling

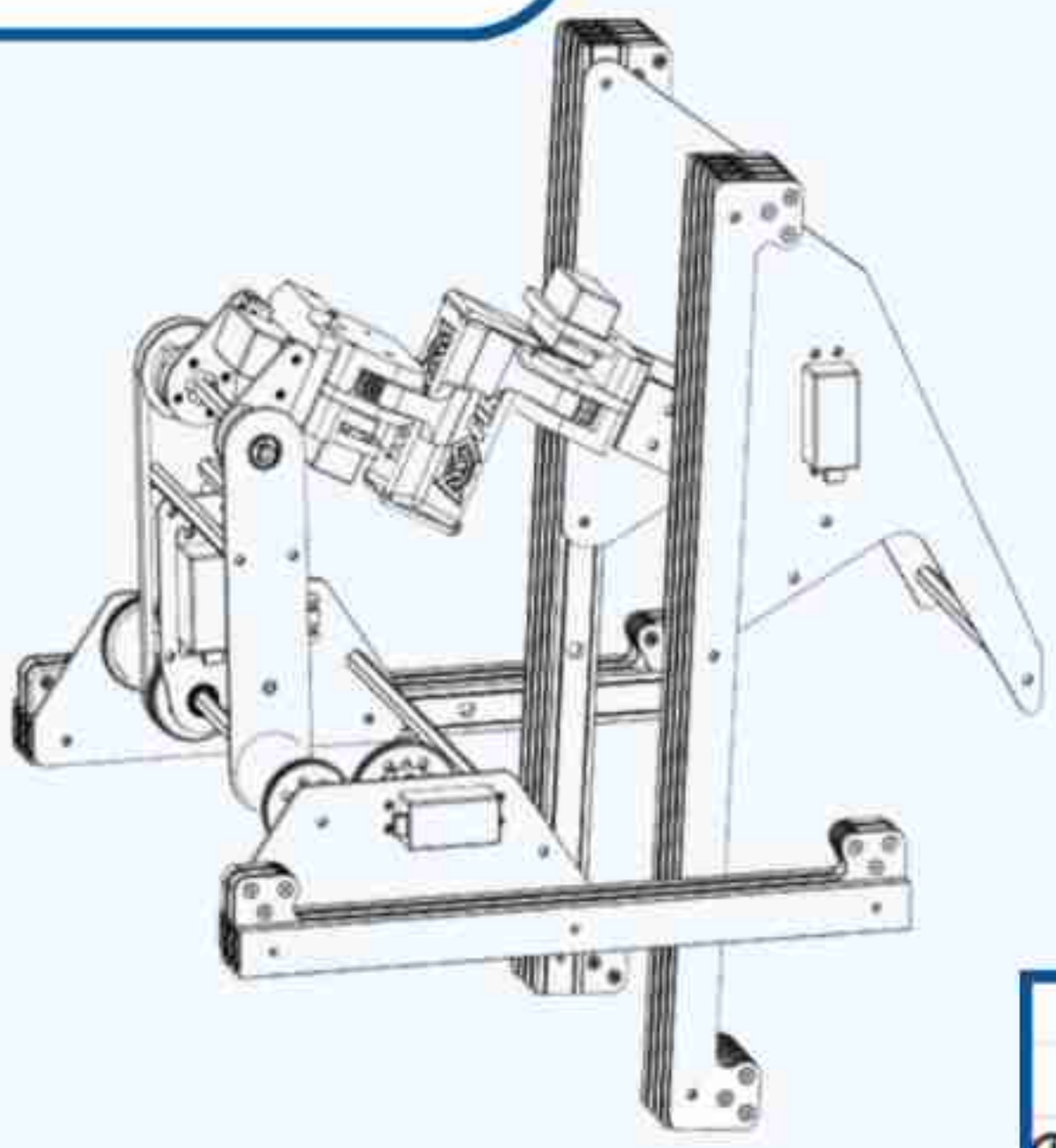


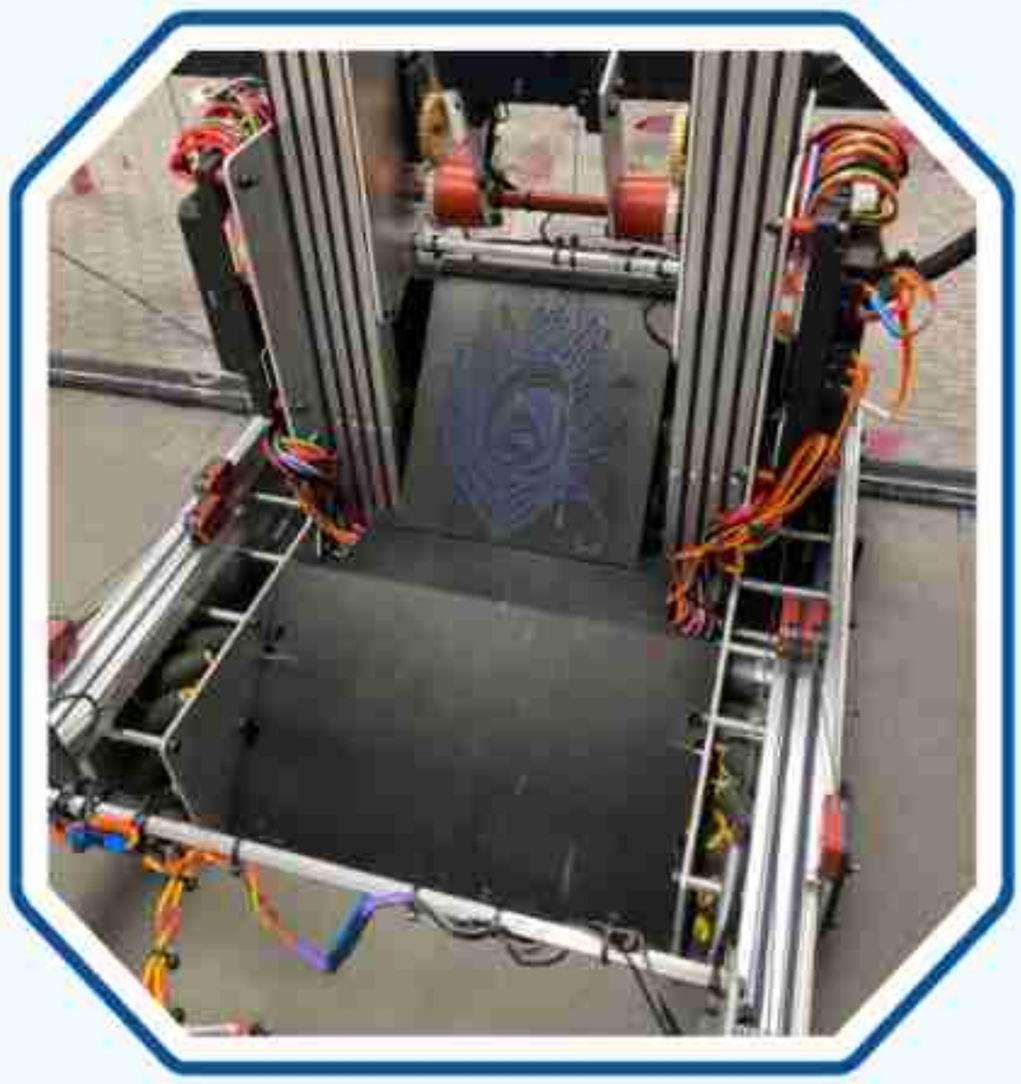
<strategy + Design Process>

Our strategy was simple: start with a high point auto, be able to score both the samples and specimen efficiently and quickly and ascend in endgame. So, in order to do so, we had to design our mechanisms so that we could do both. We have driver controls that allow our mechanisms to be used for so that we can be as efficient as possible. We use threads and mechOps to automate many of our movements as well.

Passive Transfer Benefits:

- Grab and score on different sides
- Able to have faster cycle times because less rotations





Custom 3D printed deflector plates to ensure no game element gets stuck inside the robot

<Total Points Chart>

	Sample	Specimen
Auto:	43	50
Tele-Op:	160	150
End Game	30	30
Total Points:	233	230

Calculations for torque, speed, and safety factors for extensions

Given:

Robot Weight (lb):	32.4	Lift String Takeup Length (in):	34.65
Pully Radius (in):	0.63	Pully Circumference (in):	3.96

Calculate:

Motor Speed (rpm):	117	223	312	435	**435 x2**	1150	1150 x2	1150 x3
Stall Torque @ 9.2A (oz-in):	950	530	338	260	**520**	109	218	327
Stall Torque @ 9.2A (lb-in):	59.38	33.13	21.13	16.25	**32.50**	6.81	13.63	20.44
Max Pulley Torque (lb-in):	94.26	52.59	33.54	25.80	**51.59**	10.81	21.63	32.44
Safety Factor (:1):	2.91	1.62	1.04	0.80	1.59	0.33	0.67	1.00
Avg Travel Time (s):	4.49	2.36	1.68	1.21	**1.21**	0.46	0.46	0.46

< design Considerations>

- PID tuning extension-reduce bounce for accurate transfer
- Changed extension motor from 435rpm to 1150 rpm to be faster
- Made the intake claw longer to have more reach when grabbing samples
- Mitigated the risk of samples getting stuck in the robot - changed the angle of the deflector plates to optimize it
- 3d printed herringbone gears on our intake 4 bar for reducing gear slip.

<autonomus Mode>

For our autonomous programming, we use two dead-wheel odometry partnered with RoadRunner and the goBilda Pinpoint to accurately measure where we are on the field. This closed feedback loop allows for accurate measurement of where the bot is on the field and accounts for errors and can correct. Our goal is to be as compatible with other teams as possible.

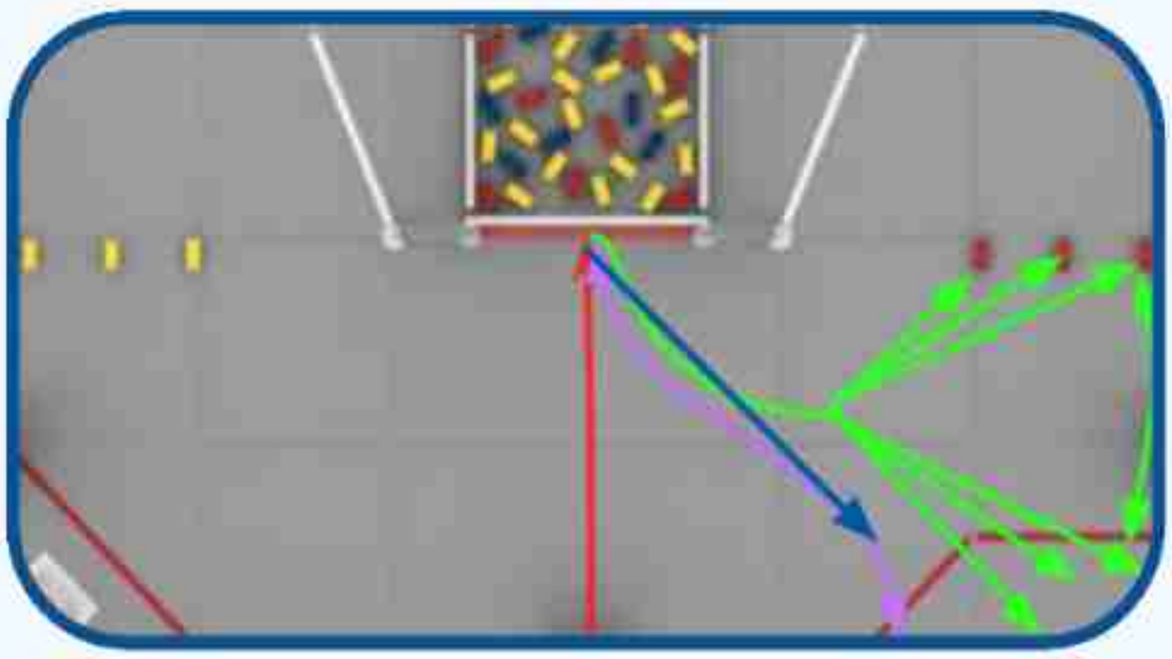
Odometry pods have been key to our success. We choose to use them because it allows for precise measurements on the field and the compensation needed to be successful in autonomous. We are using the new goBilda 4-Bar odometry.

With the fast refresh rate of localizing the robot's position at 0.00065 seconds, the goBilda PinPoint is the most accurate dead-wheel odometry system on the market.

We were privileged enough to test these products for goBilda prior to their formal release and are excited to use them to enhance our precision on the field!

We use Road Runner because it is an easier way for us to implement complex pathing while we maintain control with velocity and acceleration. Before auton, we put in coordinates for the bot to go to for the extra samples.

We experimented with Pedro Pathing but decided to stay with Road Runner for because we were more comfortable with it and it seemed to have some bugs that we couldn't figure out.



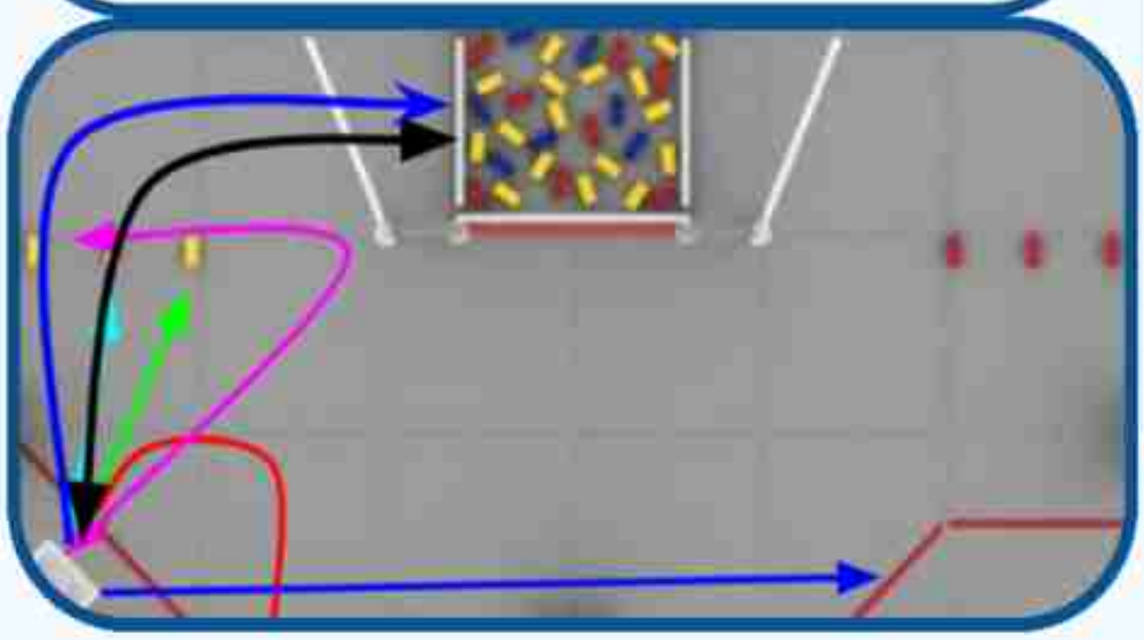
4+ 0 and 5+0 Sample

Autonomous Sequence:

1. Spline to high basket and score preload
2. Spline and grab Sample 1 and score in high basket
3. Spline and grab Sample 2 and score in high basket
4. Spline and grab Sample 3 and score in high basket
5. Spline to Sub and grab a sample through pre selected coordinates and score if 5+0
6. Park in either Level 1 zone or Alliance area

Total Points: 35 (possible 43)

Carryover into Teleop: 67 (possible 83)



0 + 5 Specimen

Autonomous Sequence:

1. Spline to high chamber and score specimen
2. Spline and grab and sweep the samples into the human player station.
3. Spline and grab Specimen 2 and Score and repeat for Specimen 3, 4, and 5.
4. Park

Total Points: 53

Carryover into Teleop: 103

Lessons Learned:

- Figuring out the goBilda Pinpoint is not easy as originally thought.
- Trying to find the right repository was also a challenge. However, once we did, the tuning was just like normal roadrunner. The measurements on the field along with the accuracy was well worth the work.
- Pedro Pathing was buggy, and we needed more time to experiment
- **There are more options of autonomous routes we can create!**

<driver Enhancements>

We have learned over the years a few things: 1) The less buttons you have the better. 2) If you can automate a mechanism, do it. So, this year, we have tried to automate as much as possible to help our drivers be more successful.

<toggle Controls>

The claws are toggle controls, which means that you use the same button to open and close the claw. This allows for repetition and less things to do for the drivers.

<automated Mecahnisms>

Mechanisms such as the extension and the lift are automated. The transfer system is a very complicated automated thread that works really well and helps us be as fast as possible.

Driver 1 Controls

DUALSHOCK 5 CONTROLLERS:

We are using the DualShock 5 controller for the Driver 1 and he has paddles that go over the controller so that he can just hit them and it hits the A and X button and not have to move his thumbs from driving.

Driver 2 Controls

MANUAL CONTROLS:

While we have the buttons to extend the extension out to the max and the lift to scoring, we also have manual control so that we can grab samples and adjust lift how needed.

FIELD CENTRIC DRIVING:

We use field centric driving to make it easier for the driver. This allows for accurate movement and direction changes for easy sample and specimen intake/manipulation.

Field Centric