

2024-2025

CYBER-NAUTS #24176

Engineering Portfolio



PRESENTED BY  RTX

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INTRODUCTION

WHO ARE WE?

CYBER-NAUTS #24176 is a FIRST® Tech Challenge (FTC) community-based robotics team in **Bell, California**. Our team includes 5 members, ranging from middle school to high school—consisting of 1 senior, 1 junior, 1 eighth grader, and 2 seventh graders. It is **our 2nd year** building a robot and competing as a FIRST® Tech Challenge Team!

OUR MISSION

Our mission as the CYBER-NAUTS is to represent FIRST in our local South East Los Angeles community by...

- Promoting inclusivity and diversity within the STEM field by encouraging participation from underrepresented groups in the community, including minorities, females, and individuals from low-income backgrounds.
- Cultivating a culture of continuous learning, improvement, and innovation within our team and inspiring others to pursue excellence in STEM and beyond.
- Providing opportunities for hands-on learning and skill development in robotics, programming, engineering, and problem-solving.

Meet the CYBER-NAUTS



George
"Team Capital"
CAD Lead / Build Team



Matthew
"Mateo"
Build Lead / Driver



Aiko
"Designated Artist"
Design / Outreach Team



Yurem
"Team Gremlin"
Programmer



Hazel
"Hazelnut"
Driver / Outreach Team



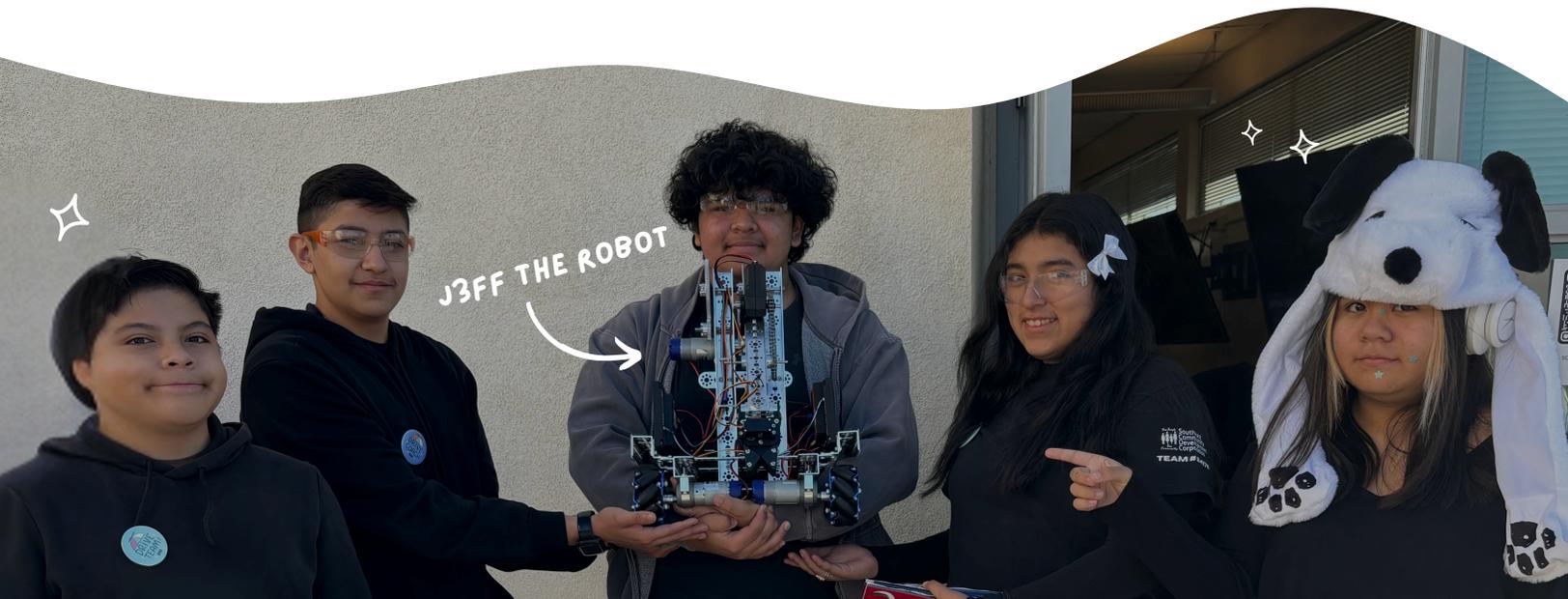
Marian
"Ancient One"
Lead Coach



Mariela
"Ms. Referee"
Mentor / Referee



Pineapple
"Space Dino"
Mascot



Team Plan
Finances & Sponsors

FINANCES

Registration includes the fees associated with participation in the competition, access to game materials, and other resources provided by FIRST. The robot parts encompasses the expenses for components, such as motors, sensors, controllers, and wheels. The "game set" refers to the field and game elements required to set up the playing field for the FTC competition. Spirit gear includes items such as T-shirts, banners, stickers, and more to help promote the CYBER-NAUTS team. General Food refers to light snacks and drinks we have during team meetings, league meets, and competitions.

| Description | Cost |
|--------------|---------|
| Registration | \$595 |
| Robot Parts | \$800 |
| Game Set | \$390 |
| General Food | \$600 |
| Spirit Gear | \$350 |
| Total | \$2,735 |



SPONSORS

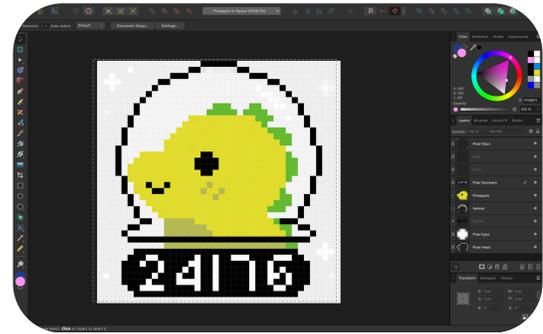


OUTREACH TEAM IDENTITY

One thing we noticed during our first year as an FTC team was that other teams had developed a distinct identity—whether through consistent Instagram post designs or a team mascot. This year, we wanted to add an extra layer of depth to our team's identity.

First and foremost, we needed a mascot! Our outreach team decided to feature a yellowish-green dinosaur plushie that Hazel owns as the face of our team, but with a twist: Pineapple, the Space Dinosaur!

TEAM MASCOT!!!!

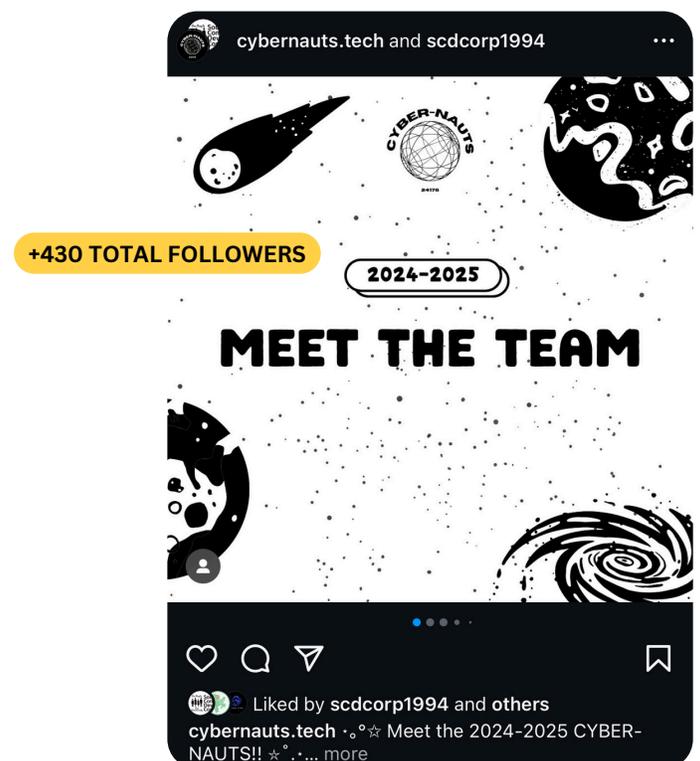


Coach Marian helped with the final details!

SOCIAL MEDIA

We've stepped up our social media presence this season! We've embraced a space-doodle theme, which is most noticeable in our "Meet the Team" Instagram post (something we didn't have during our first year).

While we don't post frequently, our Instagram stories have a vlog-style feel, giving our followers a behind-the-scenes look at our journey. We show others than it's not only a linear path of building a robot, but with a lot of road blocks and learning experience!



OUTREACH

Motivate

Peer Outreach:

- **FLL 45360** - At the tech center where we meet, there's a 4th-6th grade FIRST® LEGO League team called *the CYBER-Stars*. We occasionally assist them with their coding or host short lessons to teach them various aspects of programming their robots. It's rewarding to help them, especially since they're excited about joining the team in the future. Yurem, *who was part of the FLL team last year*, was inspired to join our team as a 7th grader.
- **FTC 25353** - We have a strong connection with a local FTC team called the *Robolutionaries*, and we often help each other out when needed. We occasionally host small scrimmages with them, as they have a separate competition style. These scrimmages give them the chance to practice using the field and collaborating with another team during matches.

General Outreach:

- **National Night Out (Aug 6th)** - Our team had a booth in which we were able to showcase last season's robot!
- **Trunk-o-Treat (Oct 26)** - Our team had a booth in which we were able to showcase our robot to the community as well as fundraise for new parts!
- **Toy Giveaway (Dec 20)** - We decked out J3ff the robot with Christmas items to demo and we manned the Hot Chocolate Station to give hot cocoa to the kids that came in for a toy.



Assisted other local teams

1 FLL + 1 FTC



Robot Demonstration at the City of Bell Truck-or-Treat!

REACH +115 PEOPLE



Volunteered at the Bell Tech Center Toy Giveaway!

REACH +80 KIDS



THE ROBOLUTIONARIES

(1/20/2025)
SCRIMMAGE DAY

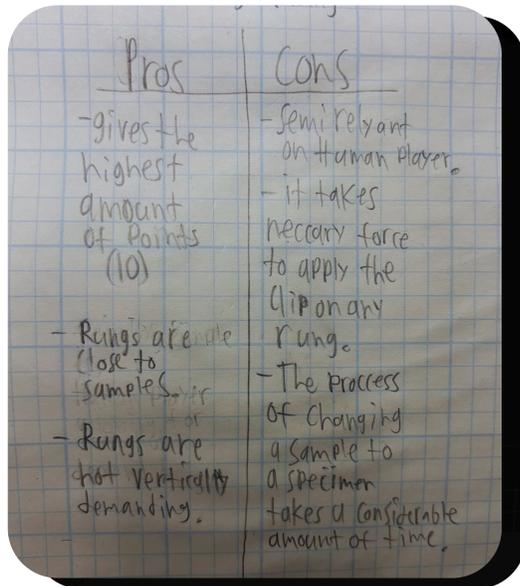
US :D

Design Process

Our team's design process for the FIRST Tech Challenge begins by clearly defining the problem we're facing, whether it's a specific robot function or a challenge task.

We then investigate the issue by researching potential solutions, analyzing constraints, and exploring different strategies. Once we have a solid approach, we create hand-drawn designs or write pseudocode to outline how we can implement the solution. With a clear plan in place, we build and test, continuously troubleshooting and refining the design as we encounter issues or discover opportunities for improvement.

EXAMPLE FOR SCORING METHODS

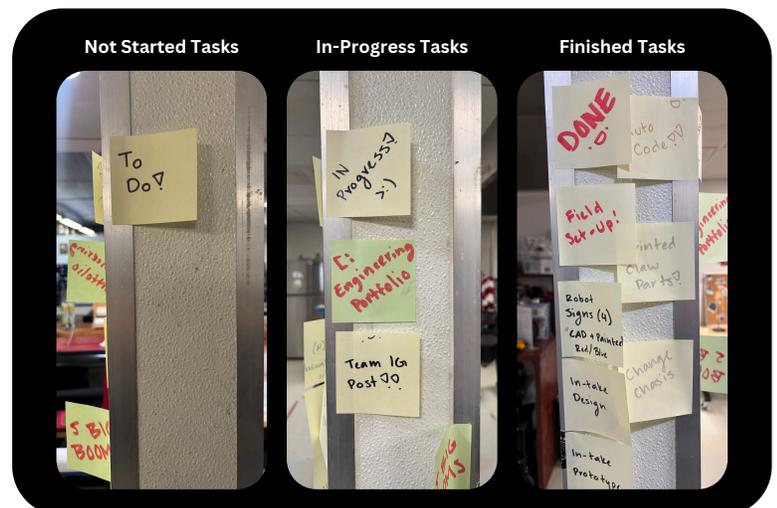


Our team put our heads together to figure out whether it's better to place specimens on the high or low rungs with the materials we had on hand.

From here, we began to draw examples of how the arm and claw may look like if we attempt to go for high rungs only.

GOAL PROGRESSION

We have a to-do, in-progress, and done list to keep track of our tasks. We do this by using a pillar in our area and using sticky-notes to state what task we need and its status.



DESIGN

Chassis

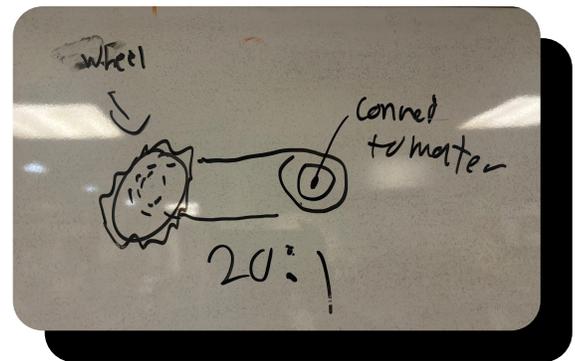
DESIGN DECISION: A grasping mechanism that picks up samples and specimens with the's claw that allows for easy clipping. than using a grasping

DESIGN HISTORY: Our chassis has been built and broken down multiple times this past few months. *We first had the wheels directly attached to the motors and our robot was very slow; this is how our chassis was last season.* This time around our coach began to point us in the direction of changing the gear ratios so that the wheels would turn faster.

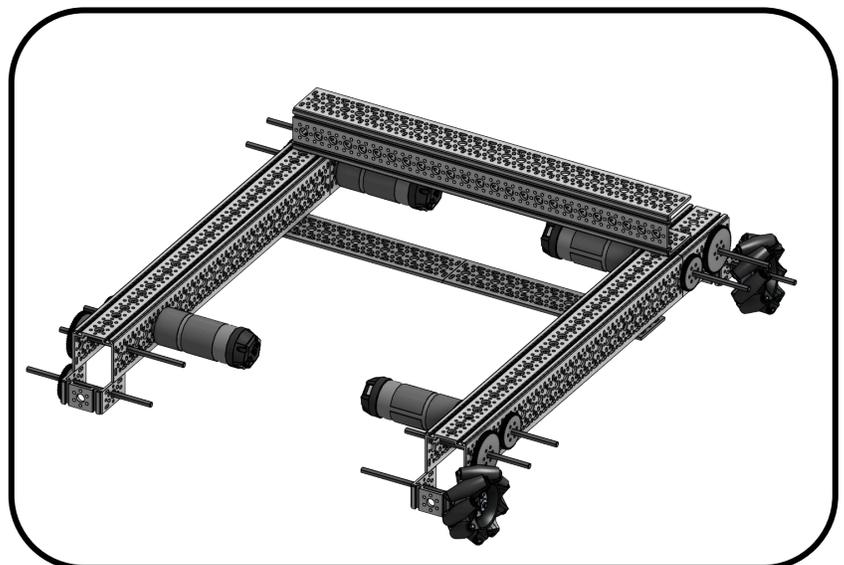
Our first plan was to put an 80-tooth gear on the wheels and connect them to another 80-tooth gear that was on the motor. *However, that did not work as we forgot how gear ratios worked. Oops.*

Then we thought about connected the wheels to the motors via chains, *but we really wanted to stick with gears to see how it would work out.* *Afterall, we just had a crash course on gears.*

Our build team ended up connecting the wheel to the motors via 80-80-40 tooth gears with the 40-tooth gear being attached to the wheel. *We used a second 80-tooth gear since we were limited on where other parts of our robots would go due to the motors sticking inward as seen on the final CAD on the right.*



Initial Plan for the Wheels



Final Design for the Chassis

DESIGN

Arm & Claw

DESIGN DECISION: A retractable mechanism that picks up samples and specimens with a claw that allows for easy clipping.

DESIGN HISTORY: We made a decision to change the arm that we had the previous season. Last year's arm was modeled after a human arm, which had three different portions: an upper arm, a forearm, and a hand. *The main issue with this design was that there was too much weight on the upper arm caused by the gravity and weight of the forearm and hand.*

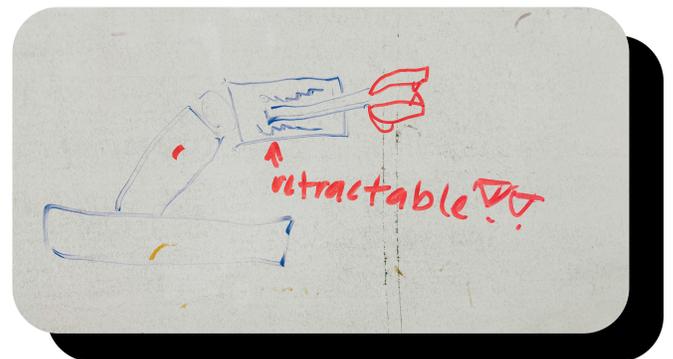
This time, we went for a retractable arm with a gripper claw that was able to pick up samples that were laying horizontally.

Our build team started drawing different iterations of what that retractable arm would look like and our CAD lead, George, got started on designing the claw!

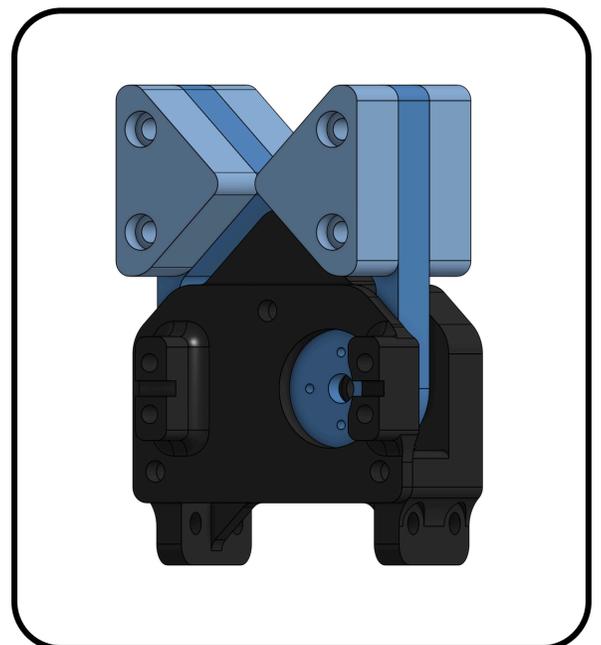
We used rack and pinion linear slide to be able to retract the claw and George made different designs for the claw. *We had to print out a side mount to connect a REV Core Hex Motor to TETRIX pieces!*

At first, we had issues with how exactly we were going to add the claw to the robot. We had to print out a prototype and then tried many different angle placements on the claw with a lot of mixed TETRIX and REV pieces.

We had the functional retractable arm ready once George made some final touches to his prototype as seen on the right!



Early Design for the Claw and Arm



Final Design for Claw

GAME STRATEGY

Our game strategy for success is rooted in strong teamwork. This means clear communication, trusting one another, and fostering amazing friendships. Regardless of the outcome, we stay focused on keeping our heads held high—there's no room for negativity on our team.

Additionally, we need to maintain open communication with our alliance teammates to debrief and strategize on what we can improve to win the next match.

ROBOT MATCH STRATEGY

AUTO

Scoring

Attach specimen to the high chamber

Parking

Park in the observation zone

TELE-OP

Scoring

Collect an alliance-color sample and deliver it to the observation zone

Once it is a specimen, attach it to the high chamber

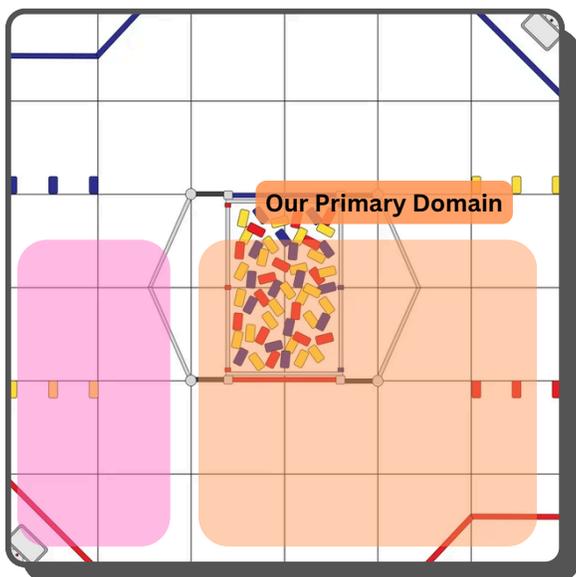
END-GAME

Scoring

Prioritize adding more specimens to any chamber

Ascension

Level 1 Ascension by touching low rung



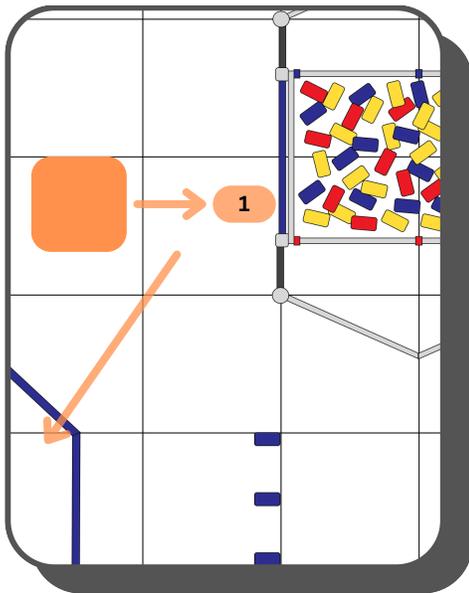
After multiple attempts, our drive team has deduced that the best location for us to score points is in the orange region if we are in the red alliance! It is easier for us to collect alliance samples to turn them into specimens to clip them on the high chamber. We should not be in the pink region.

We can go for the baskets, however, we will score less than if we were to stick to attaching specimens to the high chambers!

Programming

We used block-code to program our robot! Since it was our programmer's first year in FTC, he wanted to get accustomed to the FTC block code environment before even attempting to code in JAVA. We hope to code in JAVA soon!

AUTONOMOUS



Autonomous Path

1. Lifting arm to be at an 120° angle from the floor
2. Move forward by half a tile
3. Bring the arm down by 1.5 inches
4. Move slightly backwards
5. Release the claw
6. Bring the arm back down
7. Tokyo-Drift back into the observation zone!

There was a lot of trial and error attempting to perfect our autonomous, especially whenever the build team did some modifications on the robots :(

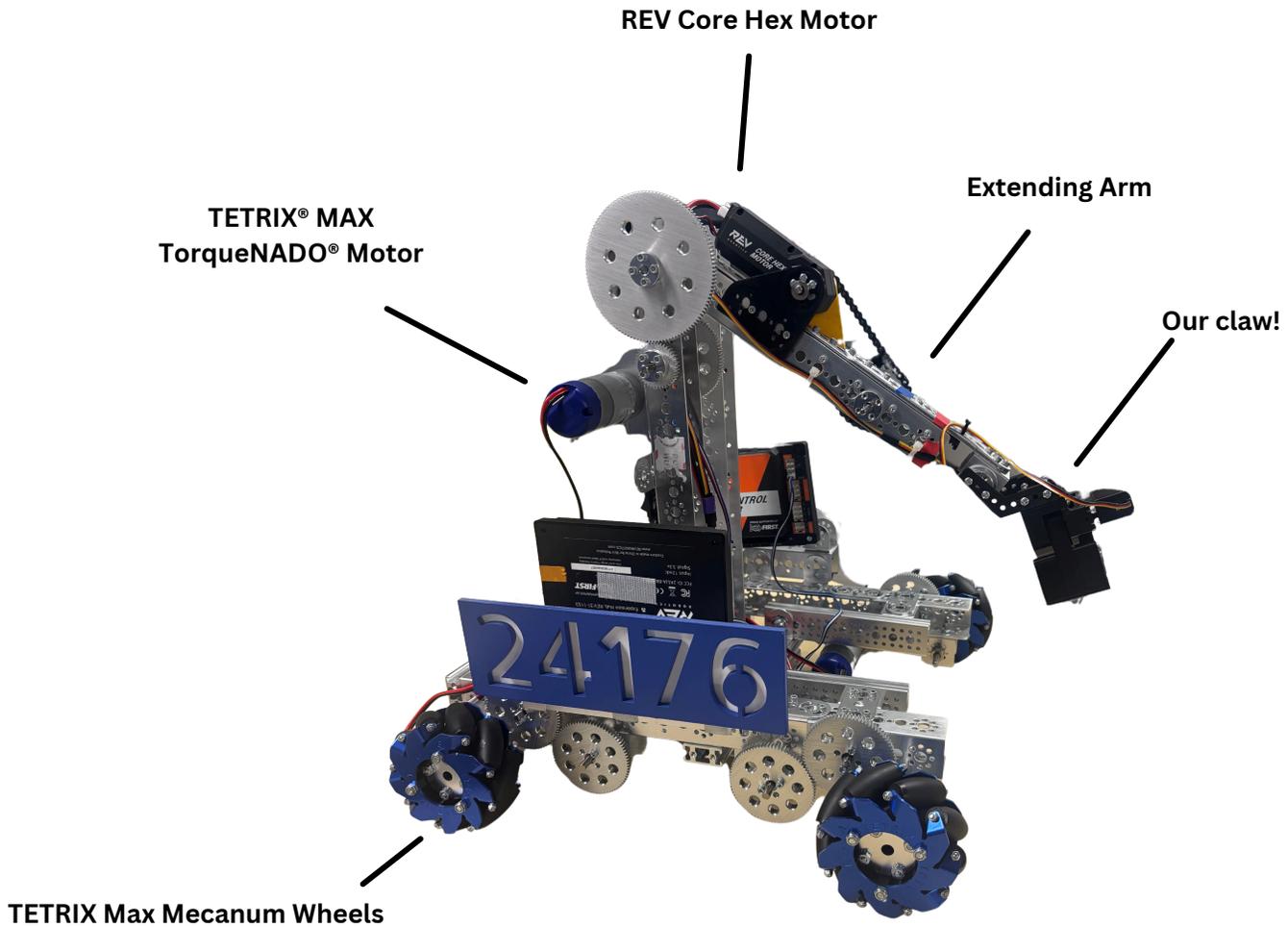
We count it as a success when the program work three times in a row without failing to attach the clip to the chambers.

TELE-OP

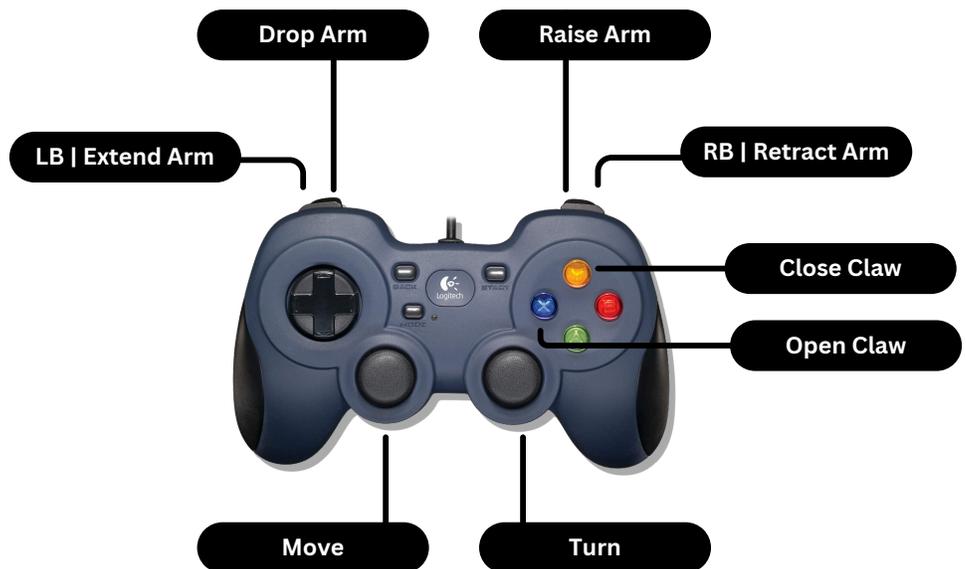
Early design for the robot controllers was based on pseudo-code and what the drivers wanted the buttons to do in regards to the robot. The Teleop OpMode allowed our driver control of the bare robot Drive Train, using the joysticks on the game controller as inputs to move forward and turn.

Once another portion of the robot was built, Yurem would ask what the drivers wanted and then would test out how much power would go into which motor and so forth. *It was very tedious as this was Yurem's first rodeo with sending power to motors unlike FLL. But, he worked through it like a champ!*

Our Robot Overview



CONTROLS

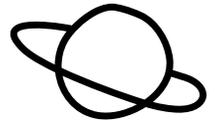


The Future and Student Reflections

WHATS NEXT?

- Developing plans and strategies to ensure the sustainability of our team, mainly recruiting new members as George is graduating this year (he's our main CAD member), establishing partnerships with sponsors, and looking for mentors to help out our coach!
- Engaging in more outreach activities to promote STEM education in our community, such as demonstrations at schools and more participation in local events
- Strengthening our collaborations with other local teams, both within our community and with teams from different schools, through knowledge sharing, or cooperative strategies during competitions.

STUDENT REFLECTIONS



“This is my second season of doing this Robotics competition and my experiences throughout the competition was really helpful due to have to take up the role of Captain and need to learn leadership skills and communication with my teammates, but I believe I did the best of my ability to help my team and improve our skills into successfully completing the task we were given upon this year, I have learned to let others speak their opinions and better help in our solution to have a better and healthier team experience.”

- **George**

“I am very happy with my designs for the team. I didn't know that people who like to draw can be part of a robotics team until I joined! Hazel definitely made coming to robots more fun, too!”

- **Aiko**

“I found this team by my amigo George after telling me about it. With my spot on the team now official, I was quick to learn and understand how this season's game works and with that my skills of creativity and cooperation improved as I worked with the rest of my teammates to score high on our meets. Overall I had a great time this season and I'm ready for the next season's challenge.”

- **Matthew**

“I have learned how to be a good teammate and made new friends! This year was super fun and enjoyable!”

- **Hazel**

“Last year, I was part of an FLL team. Now, I have learned how to code more with block code and now have a deeper understanding of how to code. I want to tackle JAVA soon!”

- **Yurem**