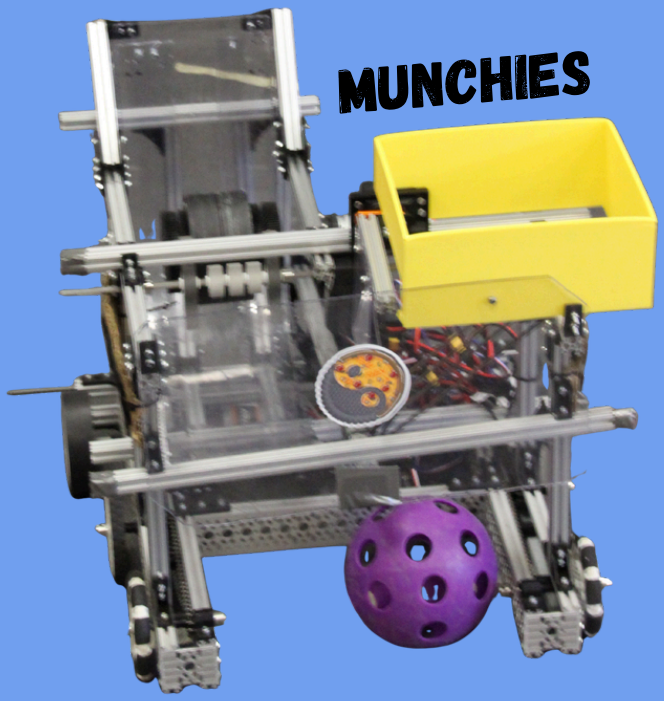
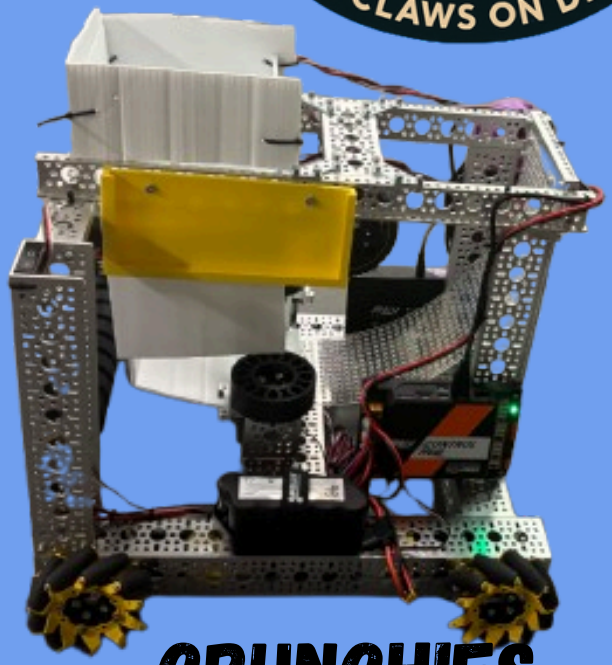
WOLVERINES

#23442



MUNCHIES

WOLVERINES
PINE LAKE
2025-2026
ALL CLAWS ON DECK



CRUNCHIES

ENGINEERING PORTFOLIO

DECODE
PRESENTED BY RTX

OUR TEAM

Team Summary

Our team is made from coders and builders from Pine Lake Middle School in the Issaquah School District. Our team has 8 members who each all either 7th graders or 8th graders.

Code Team

Abhinanthnan N. (Abhi) Grade: 8

Edward C. Grade: 7

Ishaan B. Grade: 7

Narasimha R. (Sim) Grade: 7

Build Team

Aditya A. Grade: 8

Maksim T. Grade: 7

Janya B. Grade: 7

Ayra K. Grade: 8

Shriyash K. Grade: 7

Coaches

Ankitha R.

Rabia A.

Parent Mentors

Preeti A.

Khalid M.

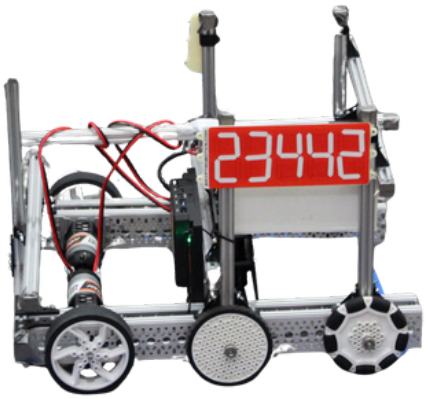
Supporters

Ms. Cappy (Principal)

Mr. Adams (Woodshop teacher)



GAME STRATEGY

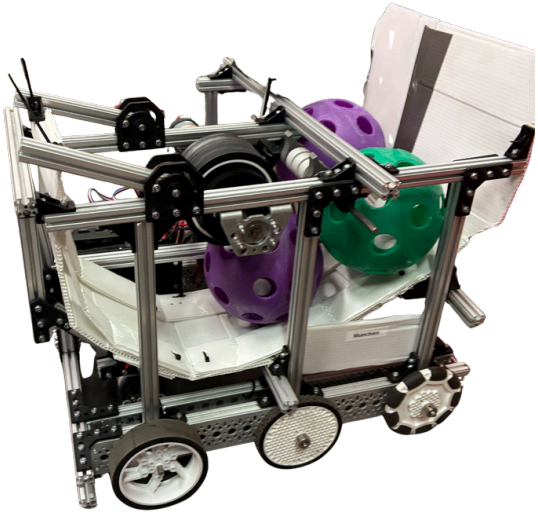


LEAGUE MEET 1

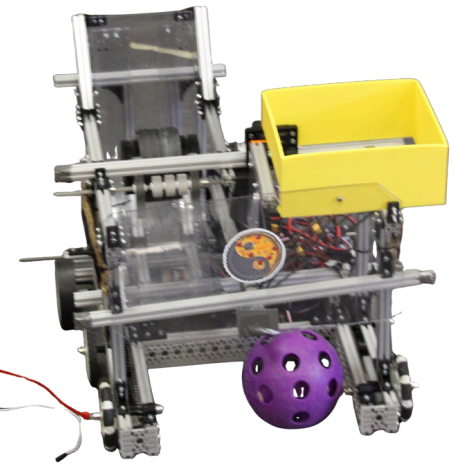
Our initial goal was to complete the starter bot. That proved unrealistic, because we were low on time so, we decide to shorten our scope and aim just for the drive train.

LEAGUE MEET 2

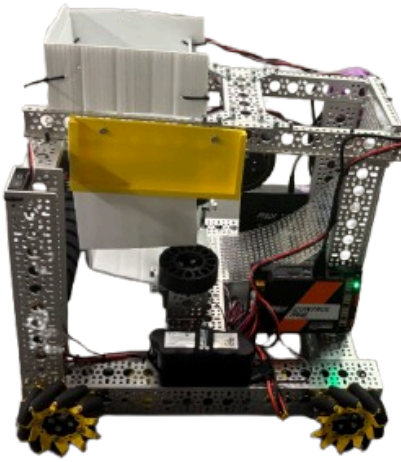
This time, we wanted to be able to launch the artifacts and actually score points, unlike last time. We finished the whole starter bot, but had a major problem. Our launcher was very inconsistent, sometimes shooting the artifacts further or closer than other times. It was also very inaccurate, we had to shoot at a 45 degree angle for them to go in about one in four artifacts.



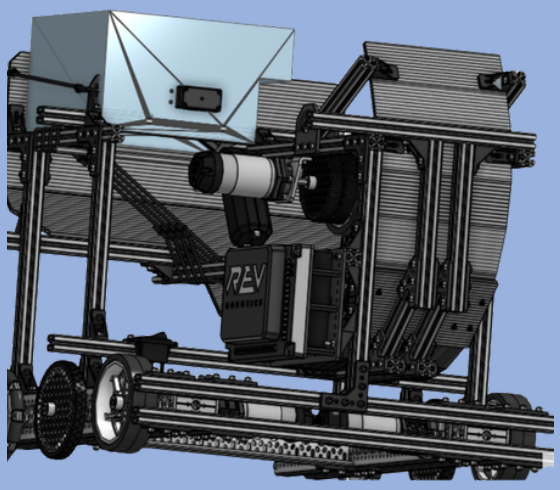
INTERLEAGUE



This time our major goal was to fix our inaccurate launcher. We replaced hopper's flexible corrugated plastic with a stronger polycarbonate sheet. This improved out launcher's accuracy and consistency, allowing us to score 2 out of 3 shots. We also added a hopper to help keep the balls in order and not falling out. This is when we added a new robot, Crunchies, which had a accurate launcher, intake, mecanum wheels, and more.



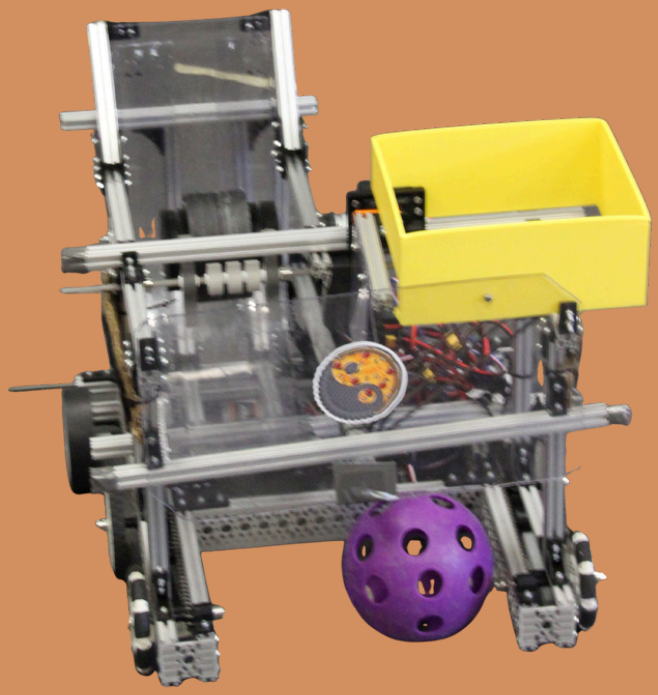
ROBOT ARCHITECTURE 1



CAD Example

Getting our robot parts only a few days before the competition, and minimal time to prepare, we still managed to bring our REV starter bot to life.

Munchies 2.0



Limitations

Although we loved how the starter bot turned out, there were definitely some things that weren't ideal:

1. Hopper & Slide

The REV corrugated sheets were extremely bendy, and we started to notice they were a bit too flexible. It seemed to make the hopper shift, making our shooting inconsistent. Because of this, we decided to completely replace the material with recommended polycarbonate sheets, which were much more sturdy

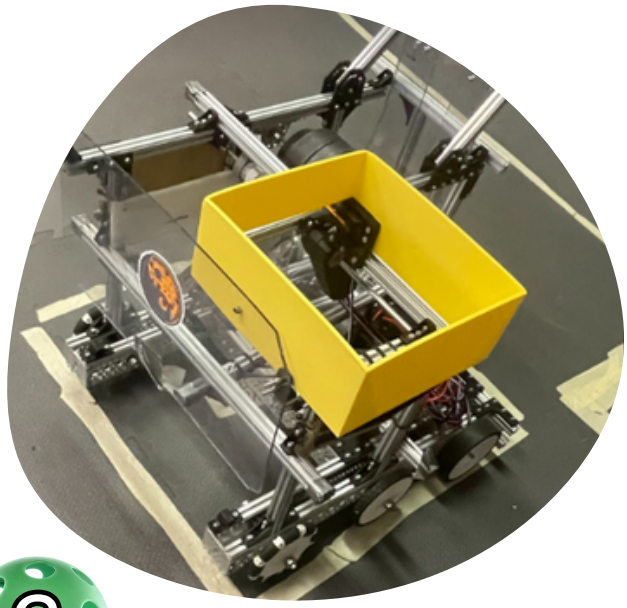
2. Ball spacing

The balls were very close together, so when our feedroller started spinning to get the balls in, the balls ended up coming out right after each other, which made the power distributed to each ball noticeably inconsistent. For this, we added a flap and a 3D printed box to stop the balls from falling in right after each other

ENGINEERING PROCESS

BUILD & DESIGN

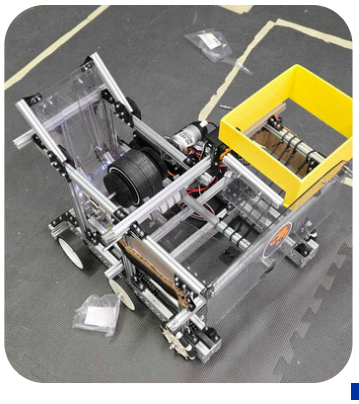
- With our first iteration, we built the REV starter bot, however, we only had 3 days to make it, so we ended up with just the drivetrain for meet 1.
- For meet 2, we fixed the problem of not being able to shoot, however, our shooting was very inaccurate due to a very flexible corrugated plastic, that bent to an inconvenient position.
- Now, in order to fix our inaccurate shooting, we replaced all of our corrugated plastic with polycarbonate. We also added a gate at the hopper to increase spacing between balls while shooting. This helps remove momentum, which was causing the balls to overshoot



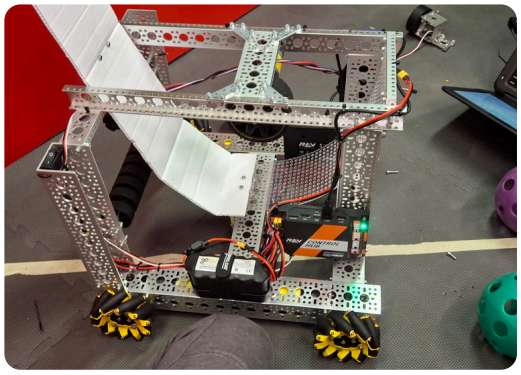
PROGRAMMING

- For our first iteration, we focused only on drivetrain control, since that was the only mechanism ready for Meet 1. Our priority was making the robot drive smoothly and respond well to the drivers.
- At Meet 1, we also added a simple autonomous that moved the robot forward to leave the starting zone. We tested and adjusted the timing until it worked reliably during matches.
- As the season continued, we improved our tele-op by adding voltage control to make the drivetrain more consistent. We also cleaned up our code and added basic telemetry to help us spot issues faster during practice

ROBOT ARCHITECTURE 2

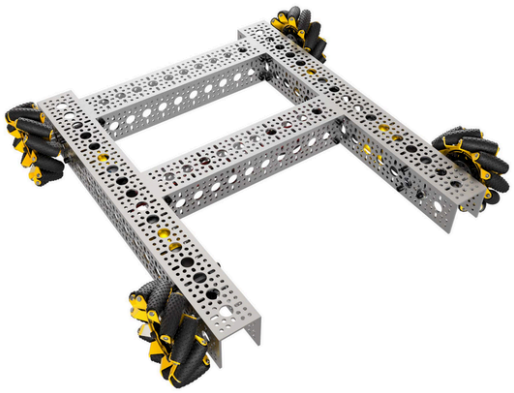


Munchies was the foundational robot that launched our competition. Built from the basic REV Starter Kit and improved (like adding a ball control flap), it allowed us to gain a basic robot to take us through the first league meets. This process revealed the critical need for a more accurate and faster shooter. This key lesson directly informed the final design of our interleague competition robot, Crunchies, ensuring success based on necessity.



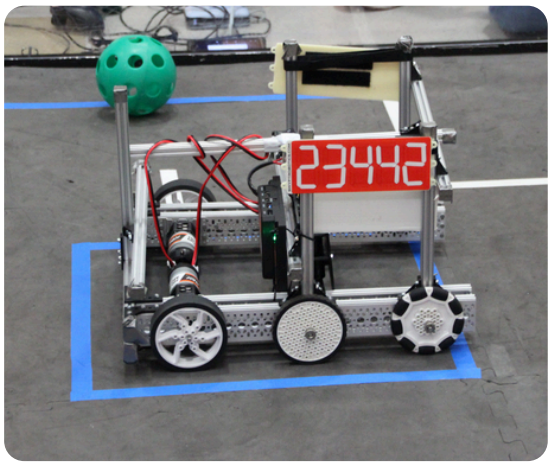
Crunchies is the evolution of our early prototype work where every test, failure, and problems shaped a more capable and functional machine. After fixing our mistakes of inconsistent shooting, the robot now delivers clean and accurate shots with amazing consistency. Built through precise engineering decisions and validated through consistent field testing, Crunchies stands as a competition ready robot built for performance and reliability.

The scoring mechanism on Crunchies was engineered for high precision and reliability, a major improvement over our other robot. This system uses a flywheel-based shooter powered by a dedicated motor to propel artifacts. Through optimization and calibration, we achieved much better aim and consistency compared to Munchies, crucial for maximizing points quickly and reliably during the competition.

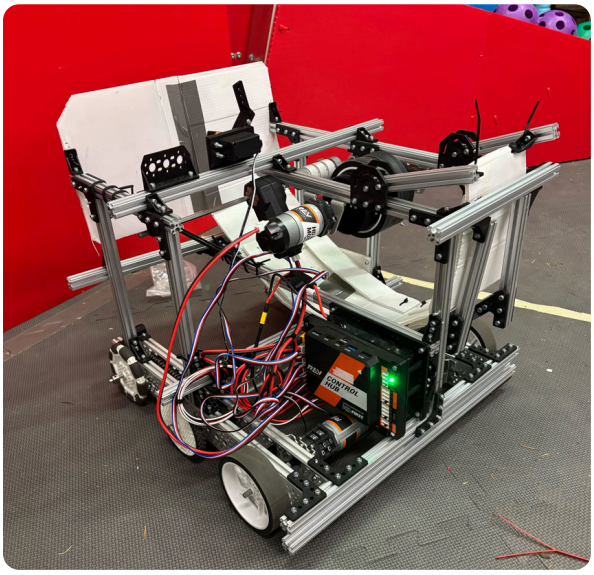


Crunchies drivetrain utilizes a Mecanum wheel configuration to achieve superior mobility and stability, a strategic advantage over Munchies' simpler setup. This system provides precise movement, allowing the robot to strafe and rotate simultaneously for precise parking and scoring adjustments. Powered by four high-torque motors, this design ensures quick acceleration and stability, which is essential for maximizing points during each competition.

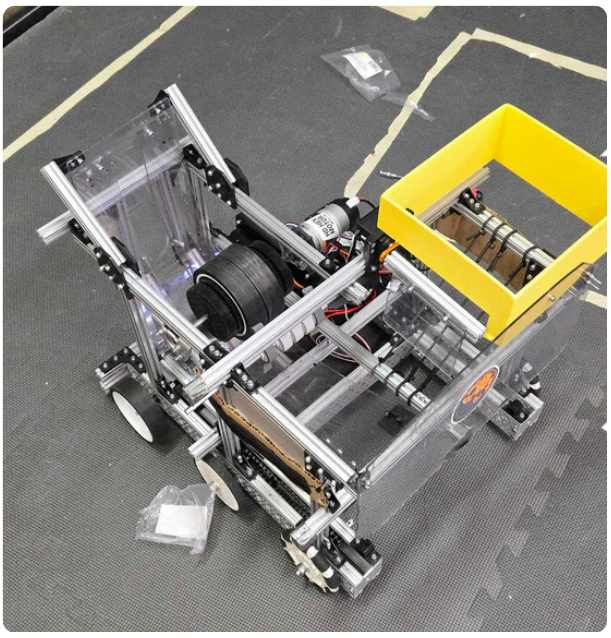
ROBOT UPGRADES (REV)



This was our first iteration of our robot. In 3 days, we carried out our robot for the first league meet. This robot consists of mostly a drivetrain.



Our second version of Munchies (Our REV robot), we added a shooting mechanism to score points, however, it was not very accurate.



Our current iteration. We swapped our corrugated plastic for polycarbonate, as it is a much smoother material. We also added a gate at the hopper in order to separate the artifacts when shooting. This makes our shooting more accurate.

ROBOT OVERVIEWS

goBILDA
DREAM • MAKE • REPEAT

Crunchies

Drivetrain

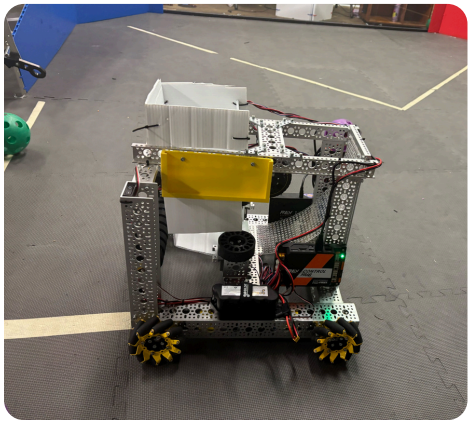
The drivetrain's mecanum wheels makes it extremely agile

Launcher

Intake Rollers- We use these at the front of our robot for temporary storage.

Hopper

We use corrugated plastic for storage, which is human intake, and GoBilda polycarbonate for the shooter.



REV ROBOTICS

Munchies

Drivetrain

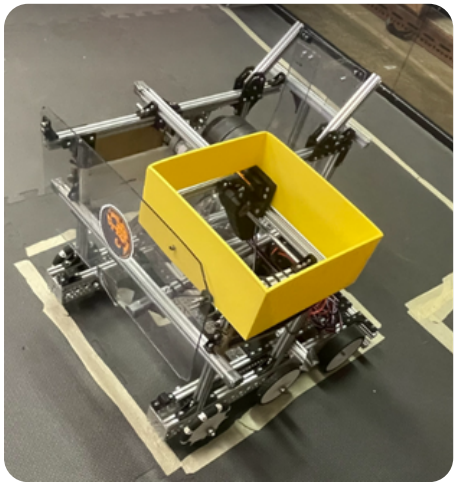
We used basic motors and wheels from the starter bot.

Launcher

We held balls in our front storage area.

Hopper

We use a polycarbonate hopper, a flap, and box for storage, and a human player intake.



PROGRAMMING

We initially thought we would just use the REV starter code, as that was already made for our robot. We then faced difficulty trying to read their code and understanding the controls. It worked, but we didn't understand the code or like the controls. After some discussion we decided to just code our own TeleOp and Auto! So we did that instead, and here are some key features and learning points below:

ENCODERS

Encoders were a crucial piece of building our robot. It helps make the motors go a consistent speed, and also allows you to see what angle your motor is at. We used it to keep the flywheel at a consistent speed and for Munchies we also made sure the feed roller is in the right angle.

MACROS

Macros were critical to improving our robot's efficiency. Instead of drivers estimating when to shoot, the code monitors the flywheel's velocity and only fires when it is within an optimal range. This allows drivers to press a single button to automatically shoot all three balls consistently.

VOLTAGE CONTROL

We had a problem where our launcher was very inconsistent, sometimes launching balls closer or farther than others. A team came to help us, and they suggested we add voltage control to the code. We listened to them and added it, and learned what it was. We then realized that we used encoders, and it automatically did a version of voltage control. We removed it but kept it in the back of our minds for later.

GITHUB

In our team, Git was the essential version control system for managing our unified code repository. Using branches was our core strategy, allowing separate coders to develop new robot files concurrently without interfering with the main code. Frequent commits and using pull requests for integration ensured we maintained a complete history of the code base and that only successful, tested code was safely merged back, keeping all competition robots synchronized.



OBSTACLES

Our team faced many challenges throughout the season, especially with our limited time we had to finish our robot before League Meet 1. These are some of the obstacles we faced that aren't involving building our robot and how we solved them:

PROBLEM

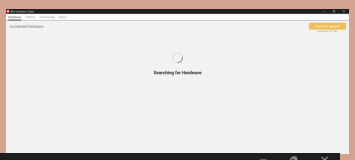
Our driver hub broke two days before the League Meet, leaving us unable to start our robot.

SOLUTION

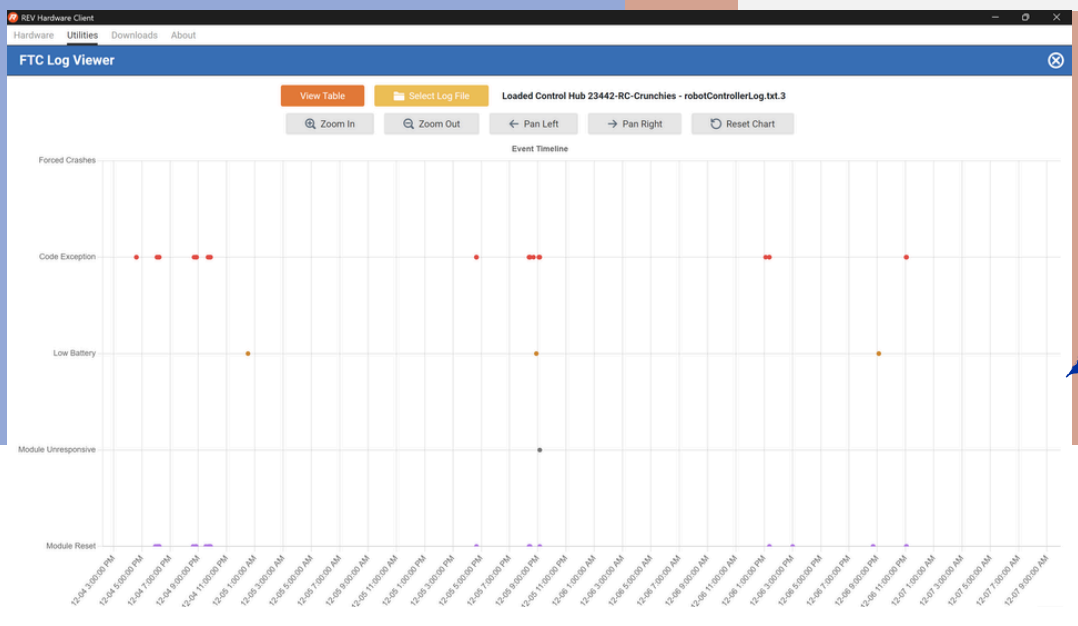
After trying to fix it for a very long time, we contacted team 23270, the Sounder Bots, who happened to have an extra to lend us for League Meet 2 until we could fix ours.

During League Meet 2, our driver hub's configuration wasn't registered as ours, and was giving us trouble during inspection as we used a new driver hub. Additionally, we had to update the driver hub and control hub and fix tons of issues causing emergency stops.

With a little help from the inspection team and the Sounder Bots, we managed to fix all the problems and pass inspection.







A chart of the different errors we encountered over the season

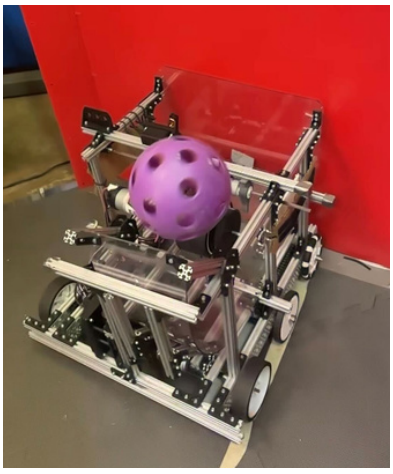
LESSONS LEARNED

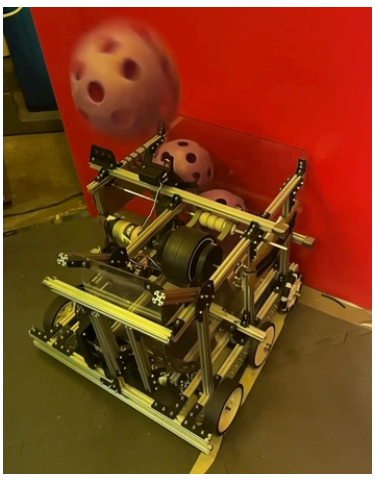
Although we had many struggles throughout the season, we learned a valuable lesson from each of them.

When we finished our first version of Munchies, our REV robot, our hopper and shooter were made out of a bendy material called corrugated plastic. Before we replaced it for a polycarbonate material, we had a lot of trouble with an inconsistent shooter. We learned to not always go by the instructions exactly, and that we could be innovative with our materials when it came to our robot.

During League Meet 1, all we had was a drive train, and we knew we couldn't get any points for shooting. But we still arrived to LM 1 with a solid strategy. Although we got very minimal points, we still managed to win a good amount of our matches with our strategy of leaving the leave zone and nudging other players slightly. We learned a valuable lesson that if we prepared our game plan well enough, it could make up for having a work-in-progress robot.

We were really confused on what was causing the inconsistent shooting until we took a slow-mo and realized the hopper was bending backwards, changing the angle of each ball. We learned that taking slow-mos of the robot could be really helpful, and following the starter bot exactly might not always get the best result.





Slow-motion shots of Munchies shooting

LESSONS LEARNED P2

As well as the lessons and learnings shared on the previous page, we have these reflections.

At league meet 1, when we had some troubles with our drive train. To solve this issue, the sub-team that was responsible worked on it, but even after working on it for a long time we couldn't find a solution. So we decided to put all claws on deck and brainstorm a solution. At the end, we found a solution and learned "It is important to divide and conquer, but never forget that we are a team overall."

While we were making our autonomous, we struggled to test out code as we were focused on building. Because of that, we only a had a basic autonomous. We realized that focusing on programming and building was equally important.

In League Meet 2, some of our players didn't show up. We were really confused, but luckily we had a few rookies who were willing to take a stand. We realized that we should train everyone how to drive the robot, not just the drive team, just in case situations like this happen.

Our team during a match when we had to use a backup driver last minute.



OUTREACH

The nonprofit organization, BUILDTHEFUTURE, reached out to us and came with some big boxes of Legos. They explained that we needed to sort them so they can make sets out of these, and give them to people who cannot afford them. We realized that outreach is not only teaching — it's removing barriers. LEGO sorting taught us how many kids never get a fair start in STEM, and why creating an FLL pathway at PLMS matters. Although multiple schools participate in LEGO sorting, for our team this was more than a simple service task. We used it as our first team bonding and service activity to understand STEM inequity and prepare ourselves for a bigger mission: increasing access to robotics at PLMS and in Sammamish.

As a rookie team with a late start this season, we decided not to chase big outreach events for the sake of awards. Instead, we focused on building a foundation for meaningful, long-term STEM impact in our own school community. PLMS currently does NOT have an FLL team, which means younger students have no early pathway into robotics. Our long-term outreach mission is to start and mentor the first FLL team at PLMS, creating a true feeder pipeline and making robotics accessible to more students.This purpose guides all our outreach choices.



BUILDTHEFUTURE explaining how we need to sort the LEGOs

SPONSORS

We would like to thank all these organizations for donating to helping our robotics team succeed, especially Pine Lake Middle School, who gave us most of our parts and funds, and Busy Bee Daycare, who let us use their garage space for building and practicing.

PRACTICE

After being pretty unprepared for our first League Meet, our team understood the importance of practicing so we are ready and prepared for the Interleague.

Our team doing a practice match with both of our robots



MENTORS

In this season, we would not have been as far as we are right now with out our mentors. Our team consists of mostly rookies, most having no experience in FTC ever before. So in the crunched time we had, we asked for the help of other teams, out of the many teams, Sounder Bots were the first to respond. the day before the first league meet, the coach of the drive team and one of the other coaches came to help us with our game and judging strategies. We would like to give a big thank you to all of our coaches and mentors.

