

TEAM 15981A

VEX High Stakes 2024-2025

Engineering Notebook

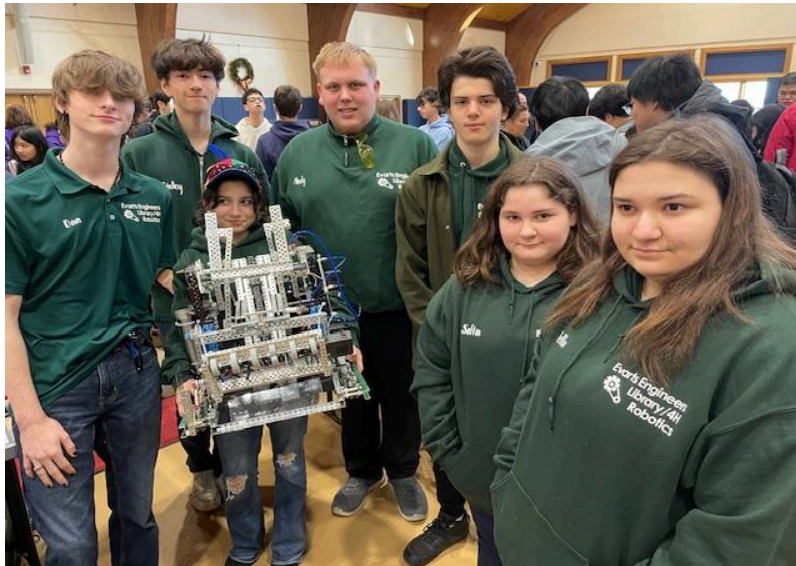


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Team bios:

1. Andy: I am 17 years old and this will be my seventh year in Vex, all VRC. I started as a programmer for the first three years as no one else wanted that role. Then I became a member of the build team. Also beginning this year I am our team's notebook writer. Also, I have been a drive team member and, more recently, one of our two main drivers.
2. Meelia: I am 15 years old and this is my 5th year in vex. I mostly work on code, but also help with other areas as needed.
3. Finley: I am 16 years old and this is my 6th year in vex. I started off helping build the robot as well as helping with coding on the side, and I now build the wheelbase and help build the rest of the robot.
4. Dan: I am 15 years old, this is my second year in Vex robotics. I started as a build team member and continued with it, occasionally helping out with small tasks in other categories. I mainly focus on building supports on the wheelbases of robots, as well as small contraptions that may aid in the success of our robot in future events.
5. James: I am 15 years old and this is my second year of Vex. So far I have only been working on the build team, mostly building intakes and practice robots.
6. Isabella: I am 16 years old and this is my first time doing robotics. I started in August 2024 on the coding team. In December, I became the team lead for the code..
7. Sofia: I am 11 years old. I joined the robotics team in September. I am on the build team, mostly doing deconstruction.

4/27/24:

Attendance:

1. Andy
2. James
3. Meelia
4. Eben
5. Finley

Goals:

1. Think about the game and what the early season strategy might be.
2. Talk about strategy for this year's robot

Today the new vex robotics challenge came out. It is called high stakes.

Vex High Stakes is played on a 12' by 12' field, the primary goal of the game is to score points. There are a couple of ways to score points. The main way is to put disks on mobile goals. The scoring is shown below.

Autonomous Bonus	6 Points
Each Ring Scored on a Stake	1 Point
Each Top Ring on a Stake	3 Points
Climb - Level 1	3 Points
Climb - Level 2	6 Points
Climb - Level 3	12 Points

In addition to that, the 4 corners modify the score of the rings on the mobile goal. For instance if you put a fully loaded mobile goal(8 points) in the positive corner it doubles(16 points)

Main game objects:

1. Mobile goal(10" wide by 14" high)



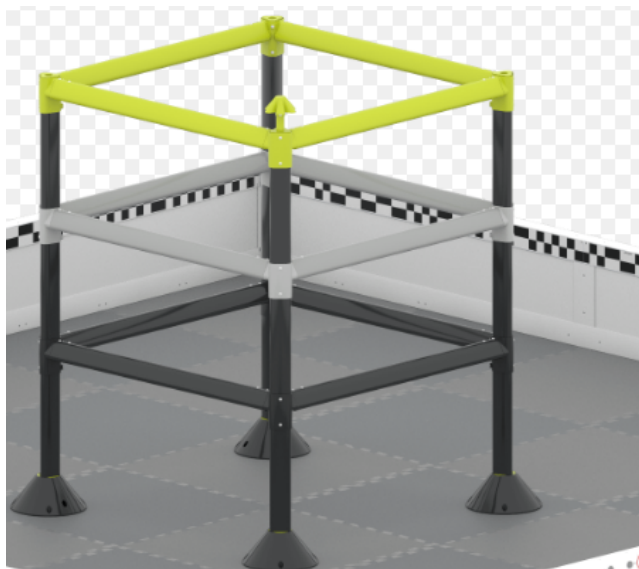
courtesy of vex manual

2. Rings(7"outer diameter X4 2"hole diameter)



courtesy of vex manual

3. Ladder



courtesy of vex manual

We talked about the scoring in more depth and we decided the meta(what people would focus on) would be the mobile goal in the positive corner as this was worth a lot of points even more than a tier 3 climb which made the tier 3 climb all but obsolete. So we decided that we would focus on getting the top ring on as many stakes as possible. Since we don't have a field yet(obviously) since the challenge just came out, we don't know whether or not it is easy to score, the guy who commentated worlds showed how you have to push down on the ring for it to score. We talked about what that might mean for strategy, and that we probably would have to find a way to push down on the ring so it could score another ring and not get jammed.

5/12/24:

Attendance:

1. Andy
2. Dan
3. Eben
4. Meelia
5. Finley

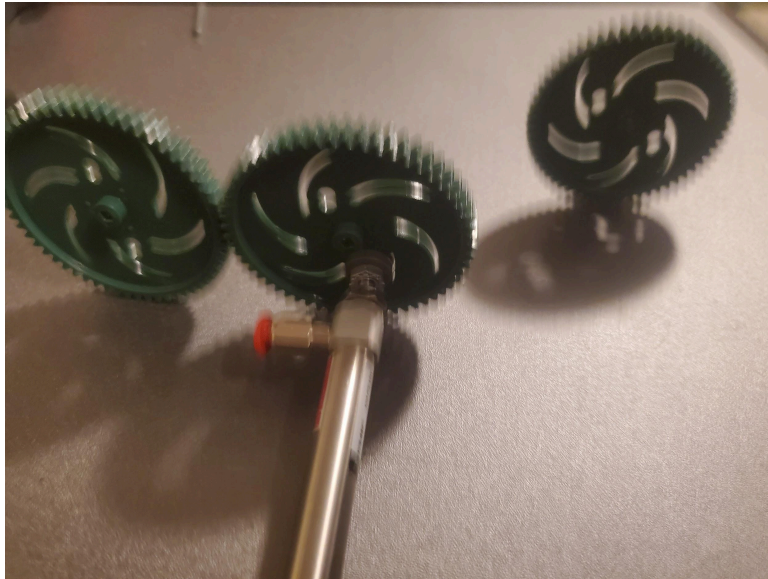
Goals:

1. Start wheelbase
2. Talk about a signature event
3. Continue to design
4. Take apart an old robot

We started to build our prototype of the robot. We split into two teams one worked on the wheelbase and the other worked on an intake for the rings. It is hard to work on a mechanism such as an intake without having a wheelbase first, so we are putting the more experienced team members on the drive so that we can finish that first, it also is the building block of any good robot and as such needs to be well built.

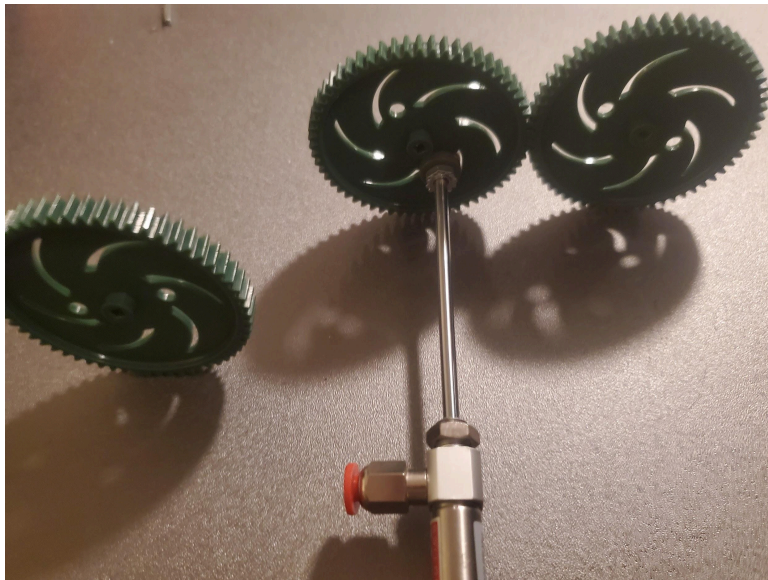
We have yet to get a field kit so we don't have any rings or a mobile goal but we still can make great progress. We are talking about 3D printing some of the field elements (such as the rings and mobile goals) so we don't have to spend almost \$600 on a field kit. We have several team members who have access to a 3D printer including one who owns one.

We don't have a prototype for the pto mechanism although we watched some tutorials on different ways to construct it. Some of the ways are as follows. One idea is to use a pneumatic piston attached to a gear by washers.



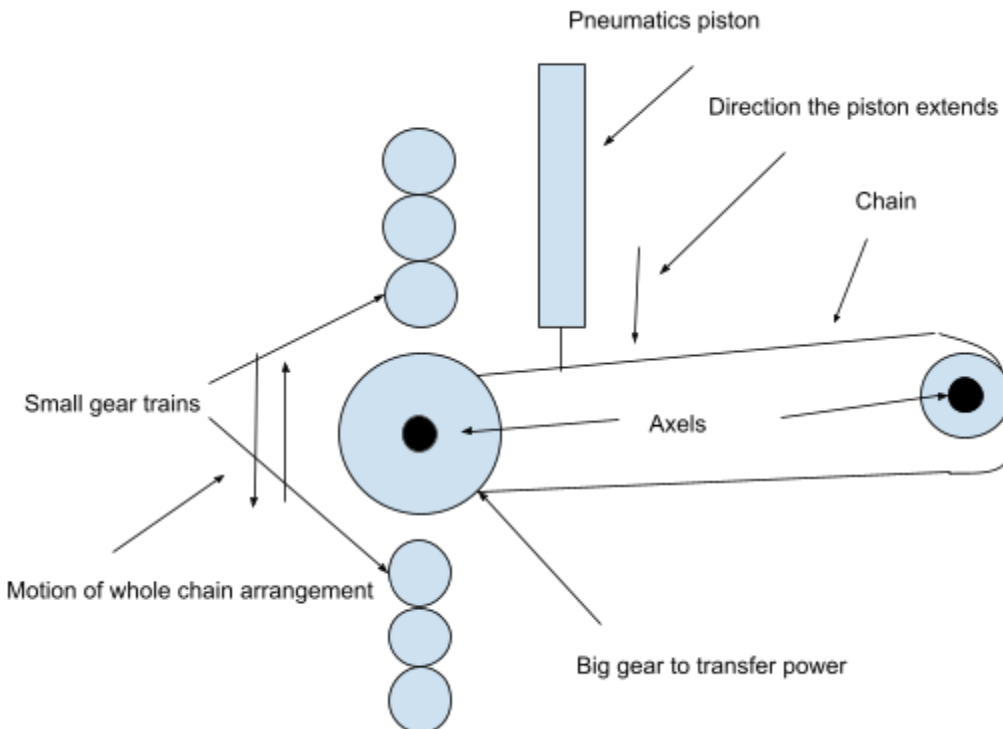
This is the piston in its resting state and the imaginative wheelbase. We just figured out that the earlier we get the wheelbase done we can maybe figure out a way to get the pto working before the summer is over.

The piston would extend and the gears would change from one gear train to another.



Pto1 This is the piston in its extended state the gear shifts from one gear train to another and therefore the power also shifts. Turning the drive from a 6 motor drive into an 8 motor drive.

Another method is an up-and-down power exchange which is a gear tethered by rubber bands and a piston that pushes the gear down and when released the piston snaps up.



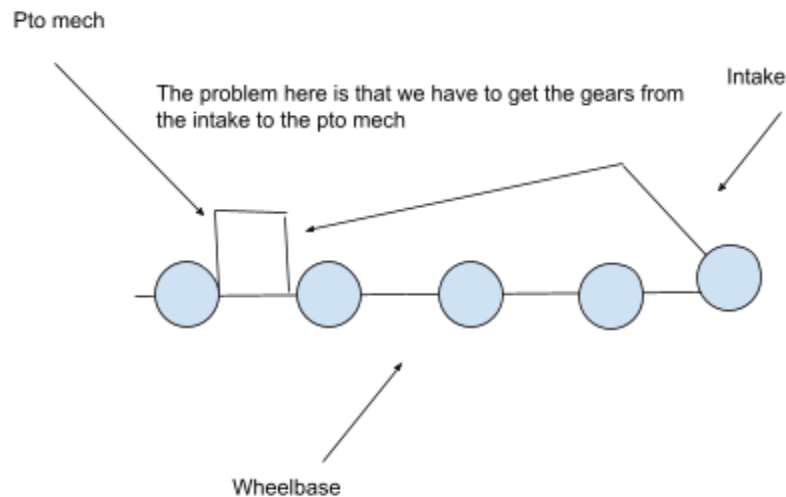
Pto2 This is harder to make but more efficient and consistent.

These are the methods we voted on these are the results

<u>Pto1</u>	<u>Pto2</u>
Meelia	Andy
Eben	Finley
James	
Dan	

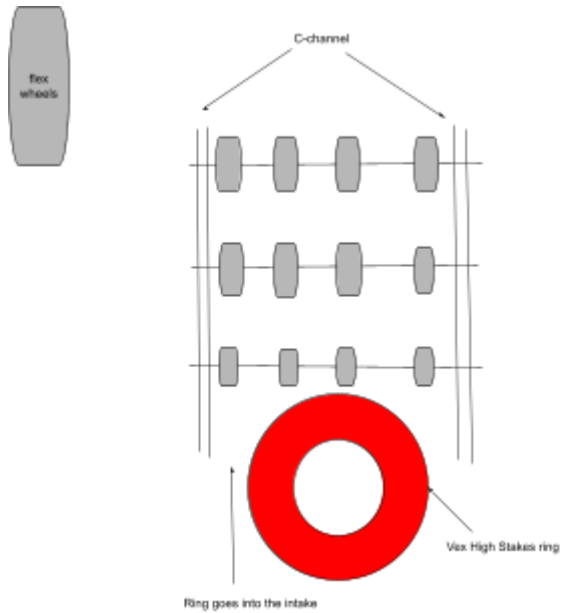
Intake

The intake team (James, Dan, and Meelia) also made some good progress in figuring out how to work with the pto drive, which is difficult because of the number of gears you need to power the intake. We want to have one motor upper stage to the intake which means that we will need to chain together the stages of the intake. This leads to a problem. We will need to streamline the whole intake otherwise the motor will overheat, which effectively puts us out of the match, especially if we are ptoing the intake we will need to make the system 0 tension.



This is a design of the intake, this shows the hardships of getting power from the pto to the intake.

Now it was time to actually design the intake for this we used one of the team-members laptops to draw some sketches.



As you can see it is basically a ramp with flex wheels to grip the disk and push it up. It will be 8 inches wide and made of L-Channel
 We started to build the wheelbase but failed to get any pictures.

5/19/24:

Attendance:

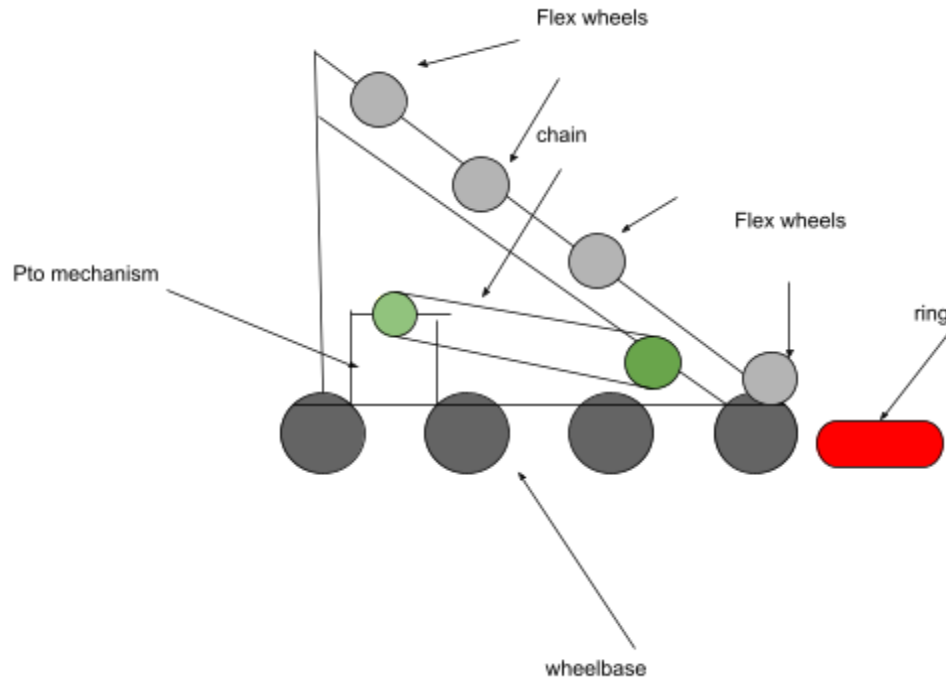
1. Andy
2. Finley
3. James
4. Eben
5. Dan
6. Meelia

Goals:

1. Make a makeshift mobile goal and ring
2. Flesh out strategy
3. Work on pto
4. Start working on the previously designed intake

Today since we still don't want to spend the money to get a field set, a primary goal was to somehow construct a mobile goal and a ring with accurate weight and dimensions. The first idea we had was to use cardboard and hot glue which ended up working. We first constructed the mobile goal which was interesting because it is pretty heavy and cardboard alone would not account for its weight. So to weigh it down we put in sand weights, we got the weight nearly perfect but the distribution of weight was a little off. The other problem with it is that we could not really recreate the part at the top, we decided after a lot of thinking that the model would be good enough and we would just have to wait until we got the actual thing. For the ring, it was pretty simple. We just made a cardboard torus sealed with hot glue.

While some of the team was working on that project another half of the team was working on starting to build the robot. We split up again with some members of the build team working on the intake we previously designed and the other half began working on the pto mechanism. The intake started out pretty great, we began making the ramp and then moved on to starting the flex wheels however we only got a little bit done on the intake in that session. For the pto mechanism, we managed to get a lot done by the end of the session. Andy and Finley worked on the pto mechanism.



5/26/24:

Attendance:

1. Andy
2. Finley
3. Meelia
4. Dan
5. Eben
6. James

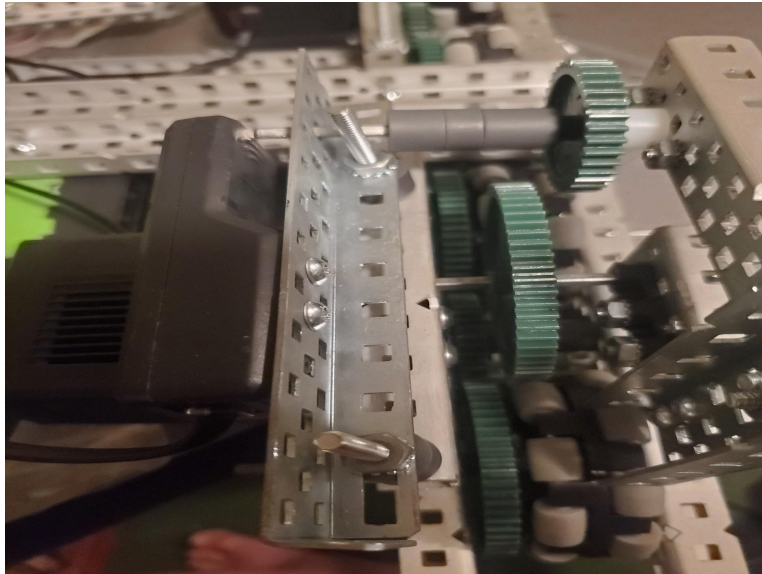
Goals:

1. Work on the pto
2. Continue the intake
3. Talk about the signature event

The pto mechanism was worked on last week and in this session we fully mounted it on the robot, however, we did not get to mounting the pneumatics on the pto. But we also got a good amount done on the lower

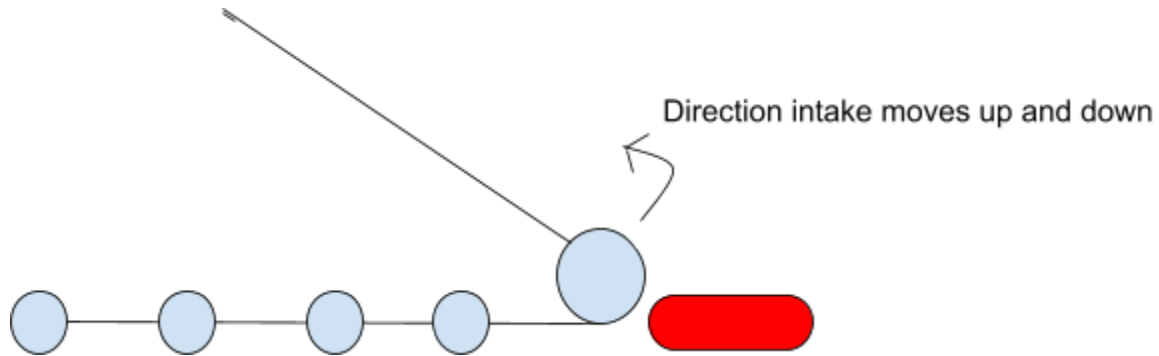
part of the intake. We in addition continued to talk about attending a signature event(the Battle of the Highlander).

1. Work on the pto: we managed to mount the pto on the robot we did this by measuring the distance between the wheels and figuring out how many spacers were necessary to ensure a fail-proof system.

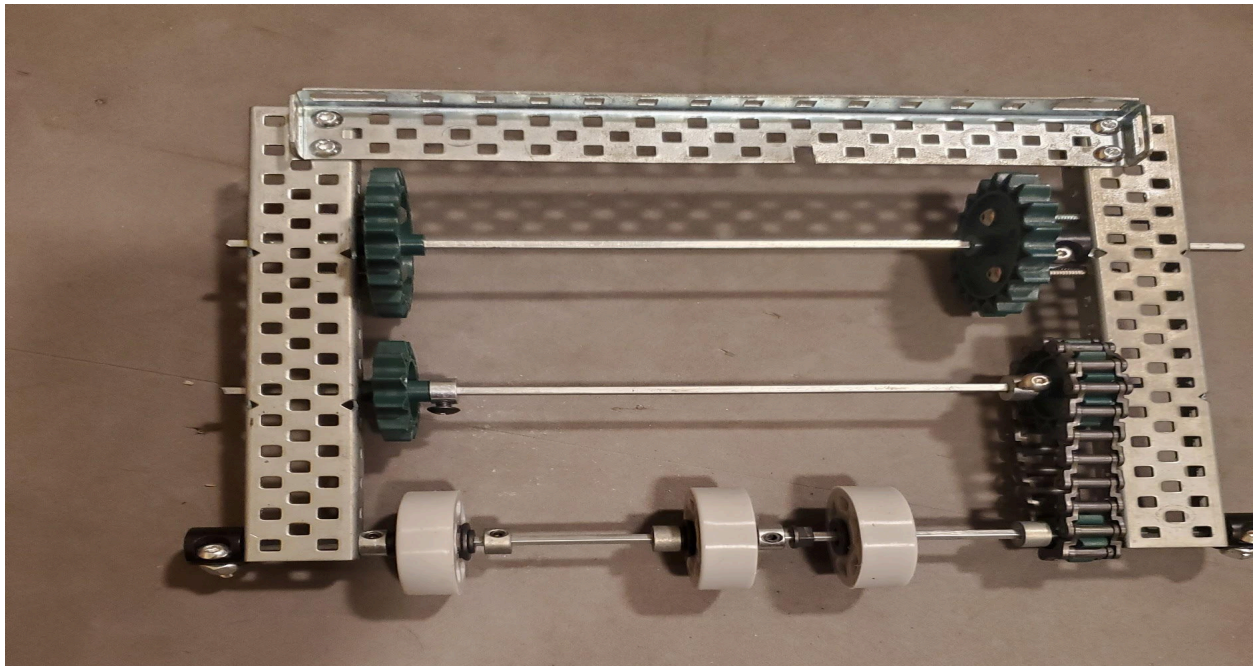


as you can see the spacers are arranged so that the gear is in the perfect placement for the gear to line up with the gear that moves. The wheelbase that we went with is an 8-motor pto drive where 2 of the motors turn into intake motors the picture shows the middle gear sliding between the gear trains. We have realized that we maybe should have gone with pto two because we are having problems with the gear not switching between trains.

We continued on the intake today, focusing on the lower part of it. The part that swings up and down in order to pick up the rings. See below for a rough sketch of the lower part of the intake.



This section of the intake will be weighted by steel $\frac{1}{4}$ inch axels to keep weight on the ring.



This is the prototype lower intake minus the $\frac{1}{4}$ inch axels there are a bunch of parts missing but this is like an outline and all good papers start with an outline.

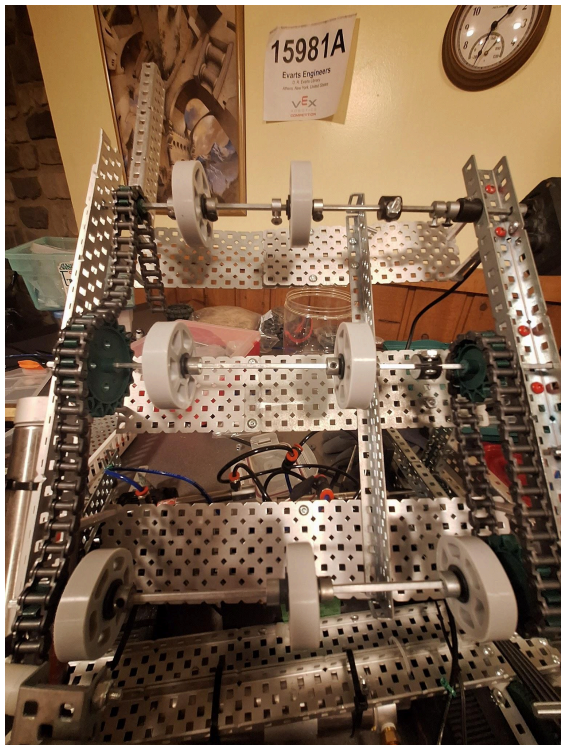
The signature will take place from September 20-22 in NJ on the campus of NJIT, we are thinking of attending for the practice of competing before other teams do.

6/2/24:

Attendance:

1. Andy
2. Dan
3. James
4. Finley
5. Meelia
6. Eben

Today we finished the intake and also attached the pneumatics to the pto mechanism. This means we can start testing the intake and fine-tuning the intake. But this also means the pto will have to be tested. Currently the intake is run by separate motors, which will need to be changed to stay within the 8-motor limit.



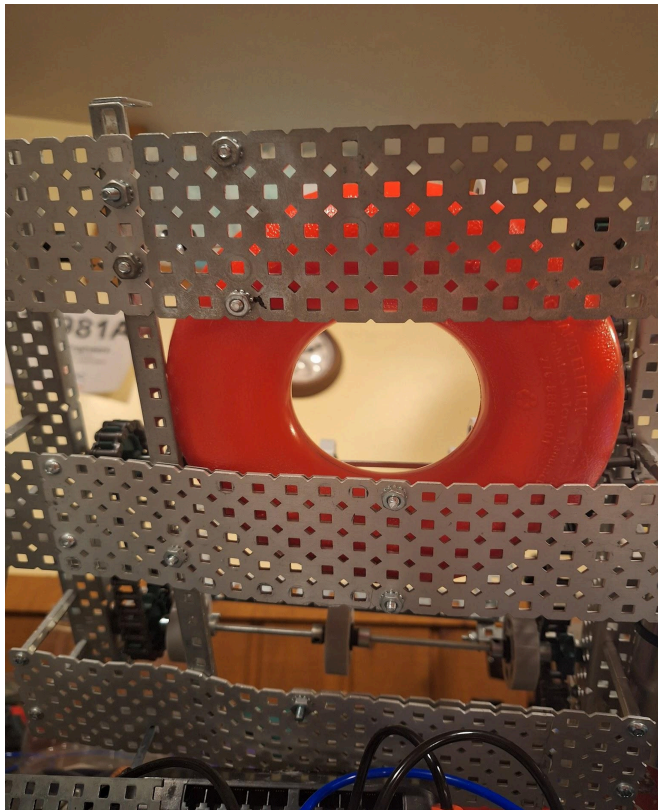
This is the finished intake. As you can see it consists of flex wheels and chains. Backed by flat aluminum pieces. Currently, we have a system that

loads it using our first stage of the intake. As seen in the 5/26/24 entry. The chain is a crucial part of the intake; it's what brings the power from the pto to the axles. The back of the intake is designed to cause as little resistance as possible to allow the disk to slide through.

The bottom part of the intake is really simple, just a couple of axles on a bar. But the amazing part of this intake comes from the hanging aspect of it. It rotates up and down for maximum effectiveness.

We also attached the pneumatics for the pto mechanism. They worked well when we tested them but we don't have working code for them yet. It will be important to have a lot of air so we attached two 100 PSI pneumatic tanks. This is the first year we are going to use pneumatics.

We tested the intake three times pulling on the chain to make the disk go up the intake the first time it didn't work. It got stuck on a zip tie. The second time it worked and the same on the third



This is a picture of the ring in the intake. The ring slides up easily and efficiently. We have made plans if this intake goes badly we can make a hook intake.

6/8/24(community day)

Attendance:

1. Andy
2. Finley
3. Dan
4. James
5. Meelia
6. Eben

Today was the town of Athens community day. This meant that we were going to be giving a demonstration of the over-under robot and showing off the wheelbase for high stakes. After that, we went back to our coach's house to have a team party and work on the robot a little bit.



This is Meelia working on our high-stakes wheelbase at the riverfront park before our demo. After

this, it was back to have a party and work on the robot. We ended up not accomplishing much but it was a great team-building exercise because we had to set up the field after carrying it a ½ mile. We also have the metal field so this was a feat of strength. There is not much else to write about since we didn't work on the robot much but we are taking a month-long break.

7/24/24

Attendance:

1. Dan
2. Andy
3. Finley
4. Meelia
5. James

Today we received the high-stakes game kit, with the full field. So we ended up spending the whole session setting up the field in our coach's basement as that was the only place that had enough space so that we could leave the field up in between sessions.

The field came in two big boxes and the first step was to take everything out of them. We have the old metal field so the second thing was to set up the gray floor tiles and the walls of the field. After this, we managed to set up the goal

8/1/24

Attendance:

1. Andy
2. Dan
3. James

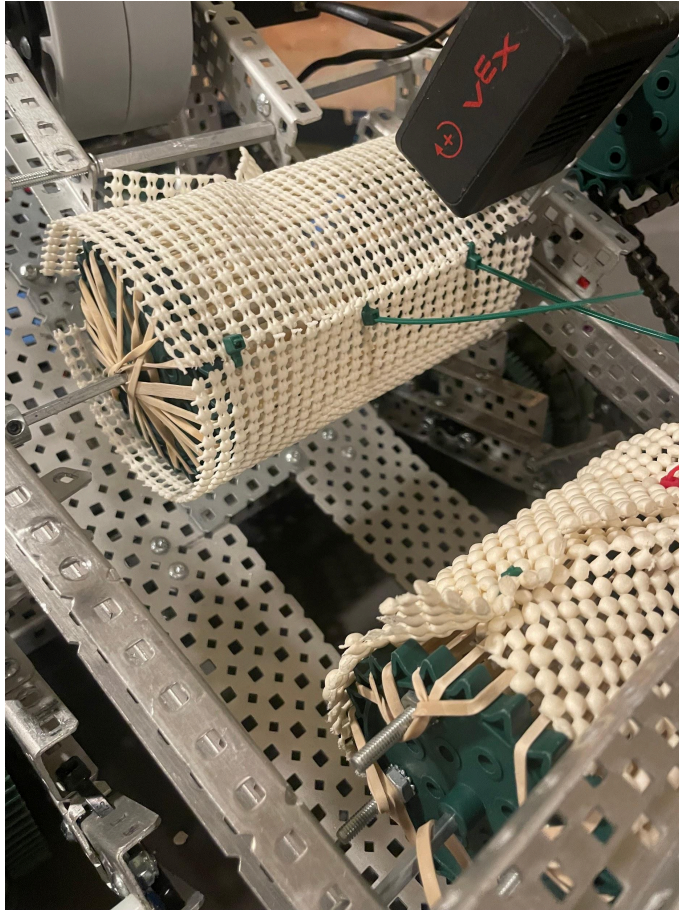
4. Finley
5. Meelia
6. Eben

Today we took off our intake because we forgot to wire manage, but when we did this, we found that one of those said wires had been getting caught in the gears of the wheelbase.

The team needed a decent robot to practice against. The wheelbase was easy enough. We just reused the old one from the over-under competition season. It was a good wheelbase and the only reason we didn't use it for the main robot was because we wanted something more specialized for this competition. For the practice robot though this wheelbase would be fine. The one adjustment we (James) made on it was adding a half hexagonal insert spot so a goal would fit snugly into a torus intake. After that we had to take off everything, the double flywheel launcher and the triball intake. Now that the robot was only a wheelbase we started taking apart the intake more. We managed to almost completely reuse it for the ring intake. We just had to add a few extra things. This sadly only spanned half the robot so we also reused the dual flywheel launcher. We geared the whole system up so that everything operated on the same code as well. But we weren't done; while we were working on the intake, other team members (Andy and Eben) were working on a "catcher" because the flywheel was too powerful and it sent the torus flying. We could of course turn down the power in the code although we decided a bender metal sheet would work better because it would guarantee the torus would not fly away and wouldn't have too little power to get on the goal. The design of both the intake and the catcher needs to be improved but it was getting late so we decided to call it a day.

James worked mainly on fixing some random problems and tightening screws on the scrimmage robot. This was because we were getting ready to practice. The main thing we did with the practice robot was add mesh to the second piece of the intake. It greatly improved its grip on disks. The

intake does not work perfectly but it is pretty good considering it was complete in around 2 hours.



8/8/24:

Attendance:

1. Andy
2. James
3. Dan
4. Meelia
5. Finley
6. Ebin

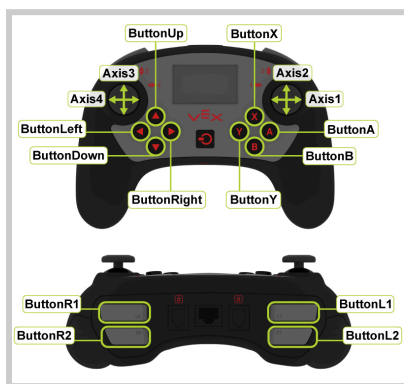
Today we finished the first prototype of this season. We also tested it with little success. Also included in this entry is the first version of the drive

code. We had some more problems with that but we managed to figure it out before the end of the session. Overall it was a pretty unproductive session but this is the week we decided to go to the aforementioned Highlander Summit.

We mainly messed around today, but we have been working very hard recently and we needed to just mess around. We played ultimate frisbee and table tennis and then worked on getting the drive code on the robot

For the code, we decided to go with a dual joystick drive or tank drive. This allows us to spin in place by putting one joystick forward and the other one back,

to explain the axis system I will use a picture of the V5 controller:



As you can see axis 3 and 4 are on the left jousting and axis 1 and 2 are on the right, that is what we use to drive our robot. The parts of code written like this “ `backleft.spin(FORWARD, (controller_1.axis3.position() + controller_1.axis1.position()), VOLT)`” are describing how each motor for the wheels work in this line it was the back left motor’s velocity is set to the position of axis 3 and axis 1. All the right motors are set to axis 4 and 2. This makes it a

tank drive, when both the right and left joysticks are moved up the robot moves forward, and when both are down it moves backward. To turn, one joystick must be up while the other is down.

```
def when_started1():
```



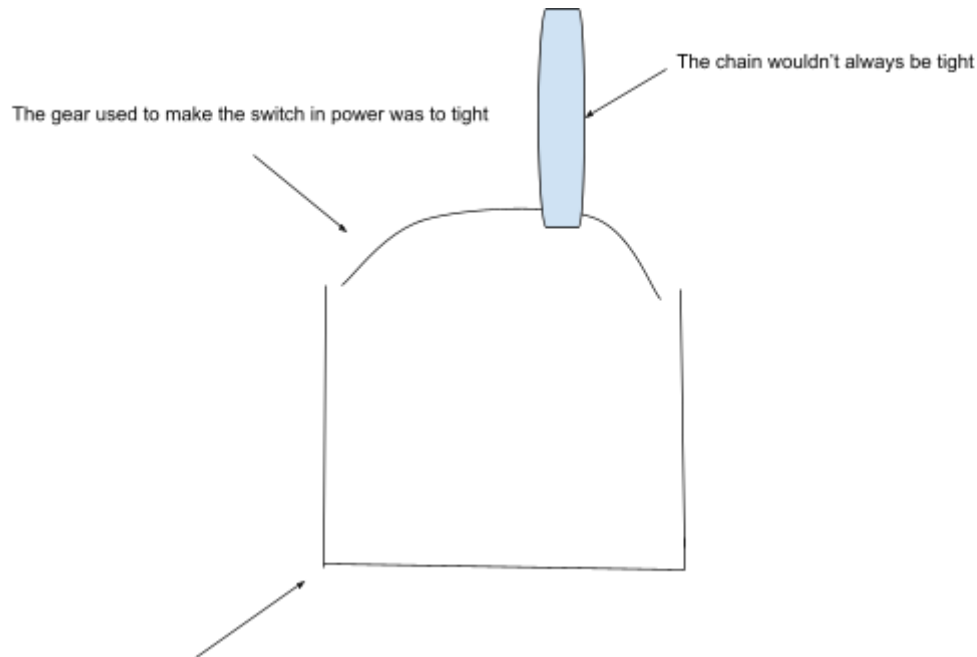
```

global myVariable
backleft.set_velocity(100, PERCENT)
backright.set_velocity(100, PERCENT)
middleleft.set_velocity(100, PERCENT)
middleright.set_velocity(100, PERCENT)
frontleft.set_velocity(100, PERCENT)
frontright.set_velocity(100, PERCENT)
ptoleft.set_velocity(100, PERCENT)
ptoright.set_velocity(100, PERCENT)
# this is the speed of all 8 motors, it makes sure that they give all their power
def ondriver_drivercontrol_0():
    global myVariable
    backleft.spin(FORWARD, (controller_1.axis3.position() + controller_1.axis1.position()), VOLT)
    middleleft.spin(FORWARD, (controller_1.axis3.position() + controller_1.axis1.position()), VOLT)
    frontleft.spin(FORWARD, (controller_1.axis3.position() + controller_1.axis1.position()), VOLT)
    ptoleft.spin(FORWARD, (controller_1.axis3.position() + controller_1.axis1.position()), VOLT)
    backright.spin(FORWARD, (controller_1.axis2.position() - controller_1.axis4.position()), VOLT)
    middleright.spin(FORWARD, (controller_1.axis2.position() - controller_1.axis4.position()), VOLT)
    frontright.spin(FORWARD, (controller_1.axis2.position() - controller_1.axis4.position()), VOLT)
    ptoright.spin(FORWARD, (controller_1.axis2.position() - controller_1.axis4.position()), VOLT)

```

Besides this part which is what is explained above, the rest of the code is all set up for autonomous.

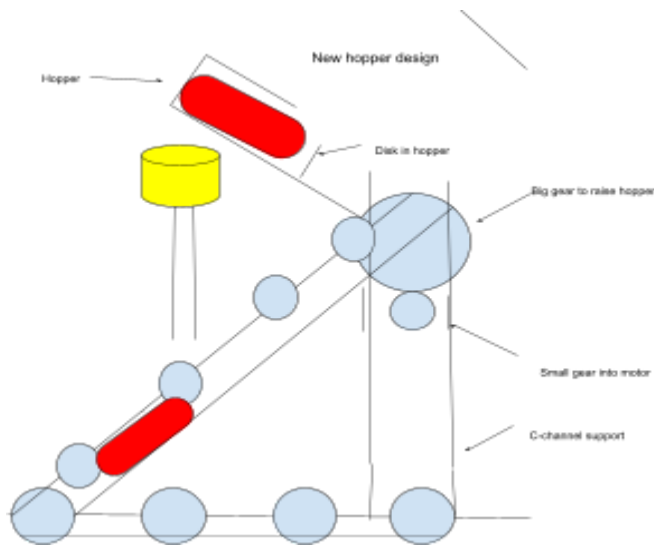
We did have a vote on whether or not we wanted a tank drive and the answer was overwhelmingly yes so the results aren't recorded here. The only people who voted no are Dan and James.



we encountered some trouble with the pto mechanism and we began to doubt whether the pto would work. See the diagram above for details

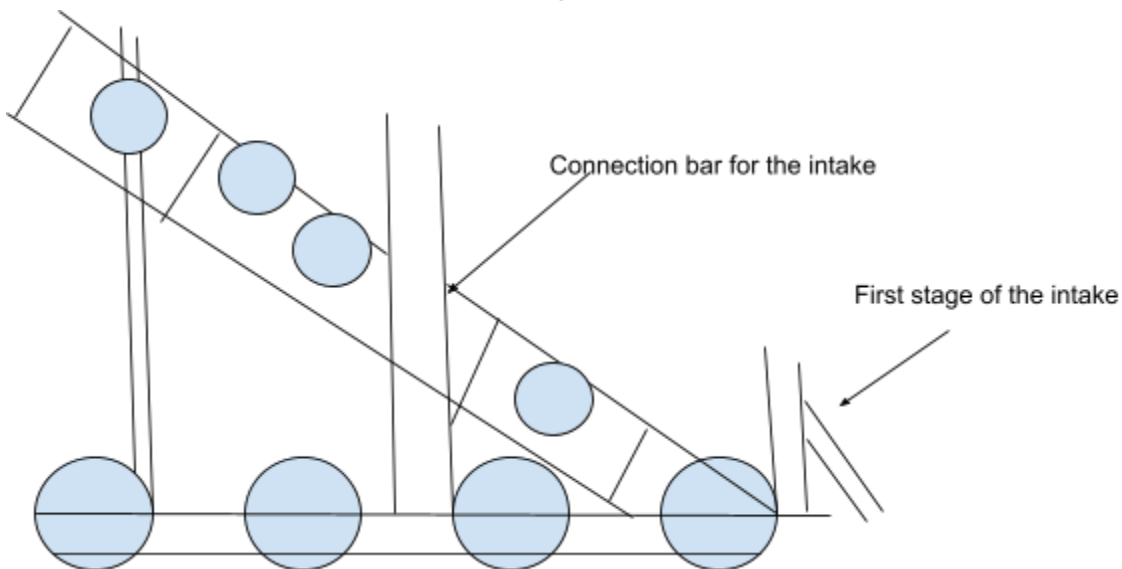
If the pto would work it would be amazing but we think it might be better to just do a 6 motor drive and do a better intake and maybe a hopper to score on wall stakes. See below for the hopper design.

Hopper Design



We are taking a month break but when we come back we will probably rebuild everything excluding the pto. And we will maybe reconsider the intake as well.

When we tested the intake, it worked well. There were some tensioning problems with the chain. We fixed that with a standoff in the middle so that the chain is always secure. Now that it was attached to the pto we had to secure it to the robot. See the diagram below.



The last on our agenda was to get the intake working well. This wasn't finished today. We encountered some problems with the chain snapping, which we will fix by adding another tensioner.

We did ten tests of the intake and the results were simple: none of them got on the goal, instead, they just fell out of the robot. We decided to fully rebuild and go with the secondary plan of the hook intake. This will be designed and built at a 5-day camp to build the robot.

8/11/24:

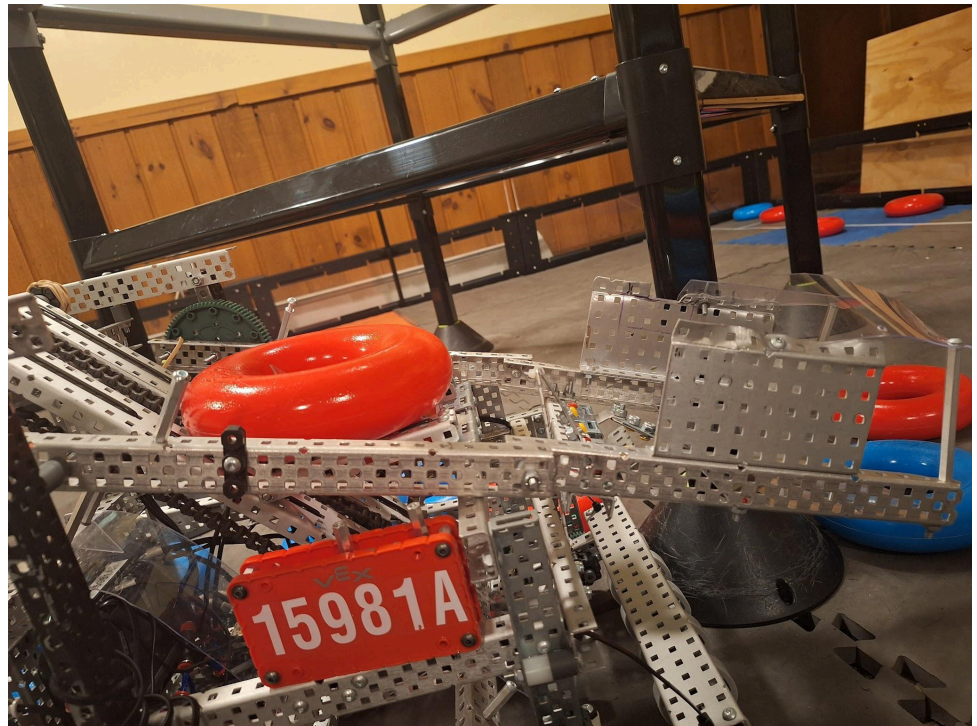
Attendance:

1. Andy
2. Finley
3. Meelia
4. Dan

Today we started the 5 day camp to complete the robot we decided to rework the intake and wheelbase completely. The plans are detailed below.

During the build week, we made many changes to the robot, testing what we had put together before, and rebuilding it until it worked well. One team member (Finley) also visited another vex team in China while on vacation, and they gave us many tips on how to improve the robot and showed us their prototype for the season. We decided to incorporate some aspects of their robot into our design, such as the rear goal clamp, while keeping our robot unique with our own designs and improving things as much as we could.

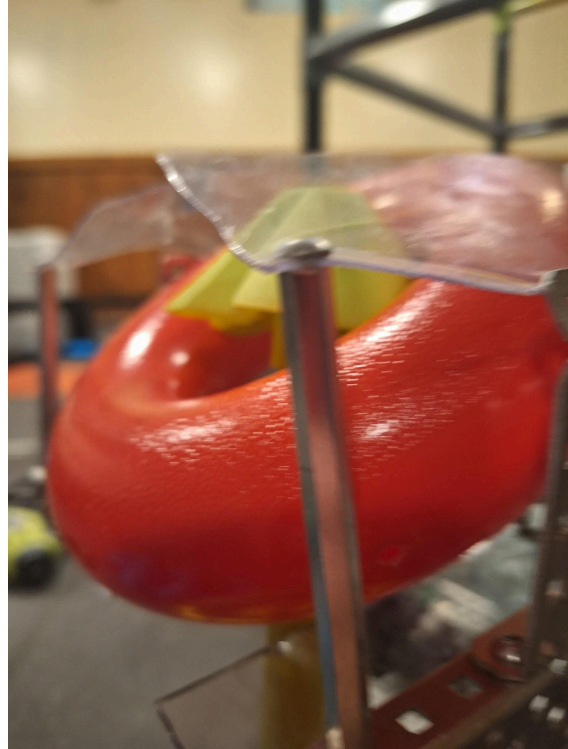
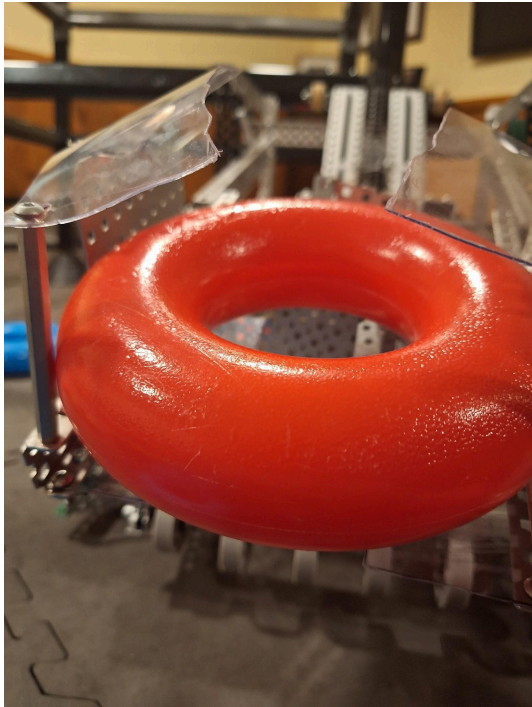
We built the hopper and this is when we decided to rebuild our intake. See below.



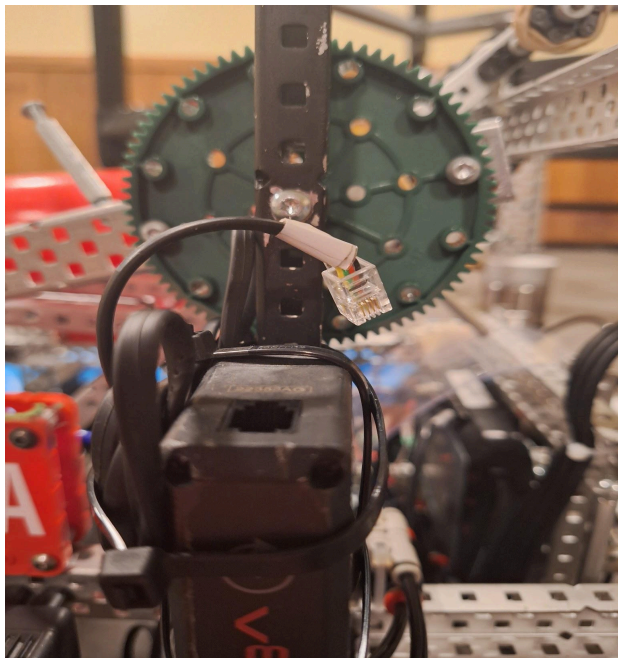
When we out-take, the disk goes straight into the hopper. We designed it so that the hopper would work in autonomous as well to score on the alliance wall stake which works well and hopefully won't fail.

Since we gave up on the pto idea we have more options this is powered by 1 half powered motor and the other half-powered motor is powering the scoring mechanism.

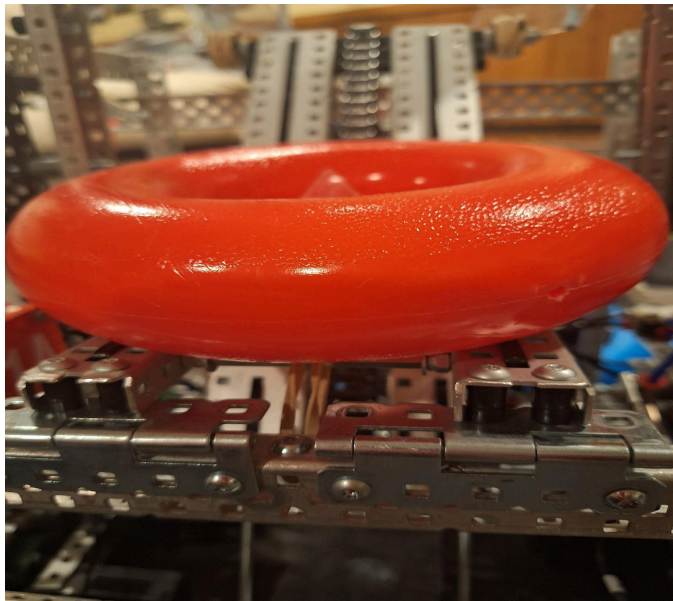
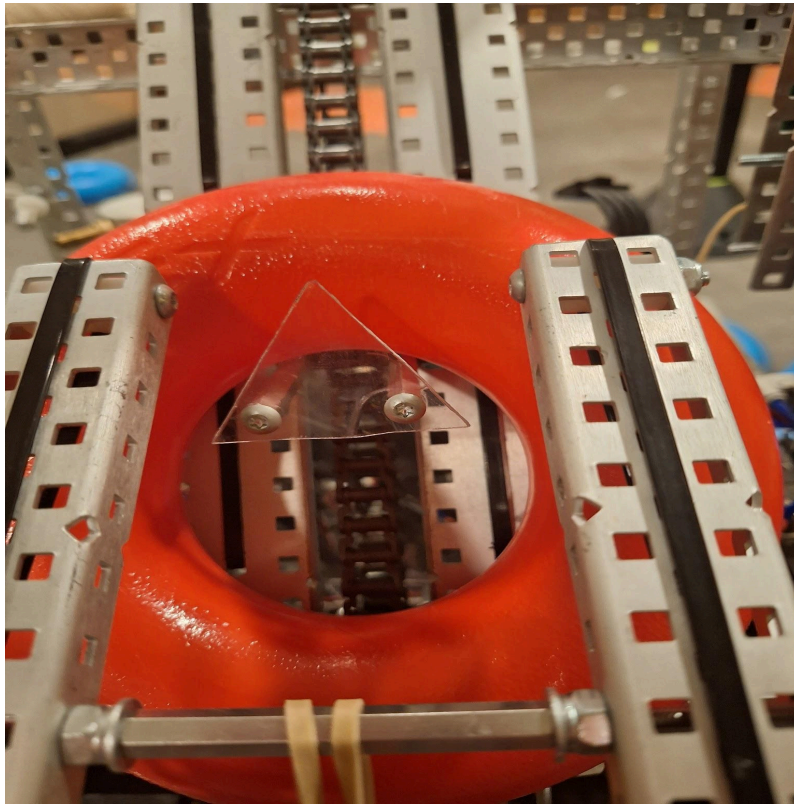
Scoring on Wall Stakes



This is how the disk scores on the stake. The arm is powered by a half-powered motor. See below.

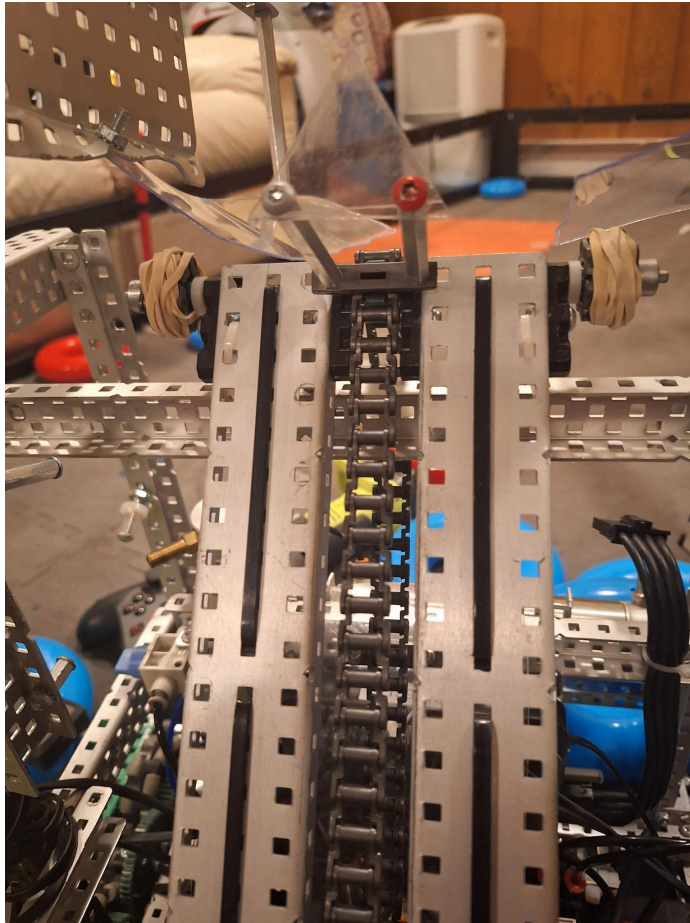


This has been a pretty consistent mechanism. However, there is room for improvement. It loads via a mechanism that is attached to our intake so that when we out-take it pushes the disk into the hopper.

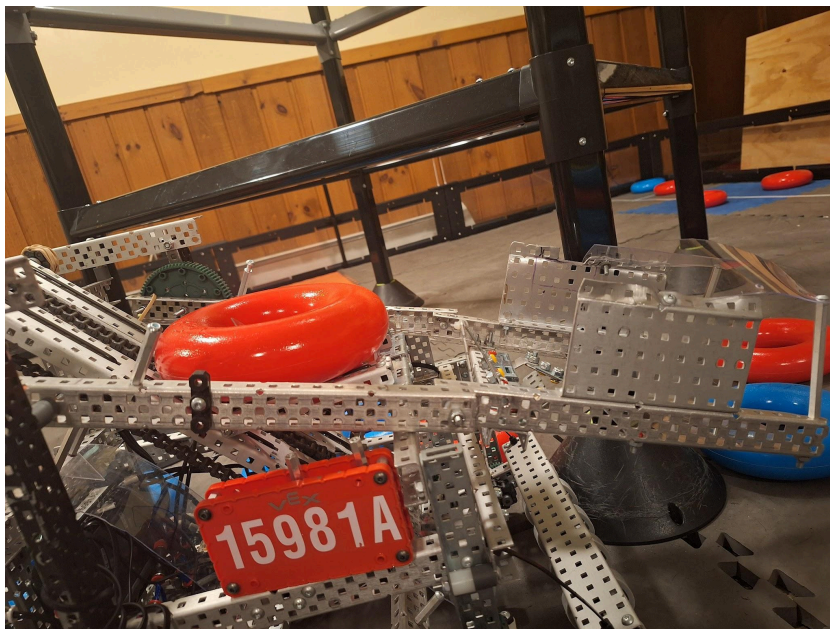
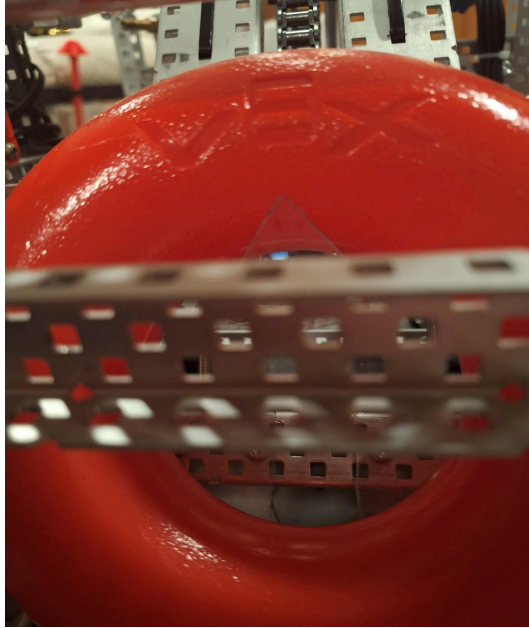


This has been hard but we have it pretty much down now.

Our intake has changed to a hook intake. See below.



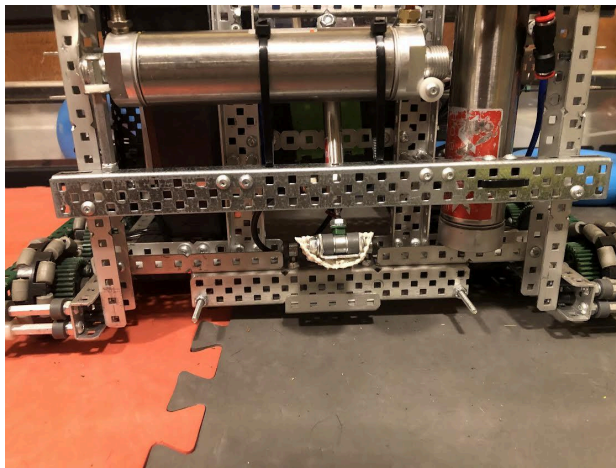
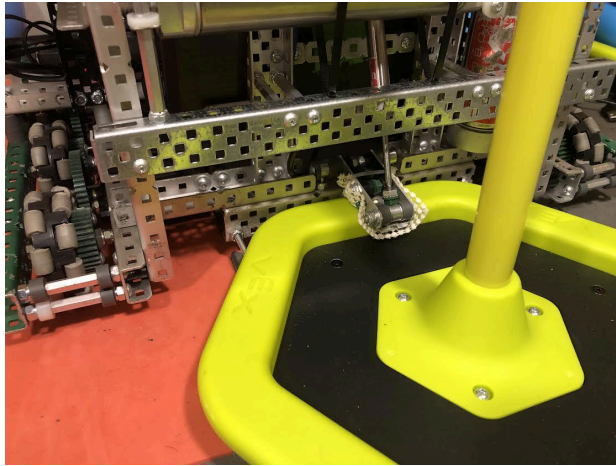
We've found in extensive testing that this works better than the flex wheel intake could have ever hoped to. This is partly because it is faster. Even with a half-power motor, the ring gets carried up the hooks and flipped over the rubber bands. It has an accuracy of around 90%, which is better than we hoped for. We will in the future make our season plans so that our coders have more time, as we have just over two weeks until the battle of the highland, and we don't have an autonomous code yet.



Rear goal clamp

Originally, this was just a bent bar that fit the shape of the goal, but we decided to change it to a clamp powered by pneumatics. Most teams used 2 pistons to get a powerful clamp on the goal, but we found that by using a

c-channel hook that went under the lip of the goal, we could use just one piston and save air.

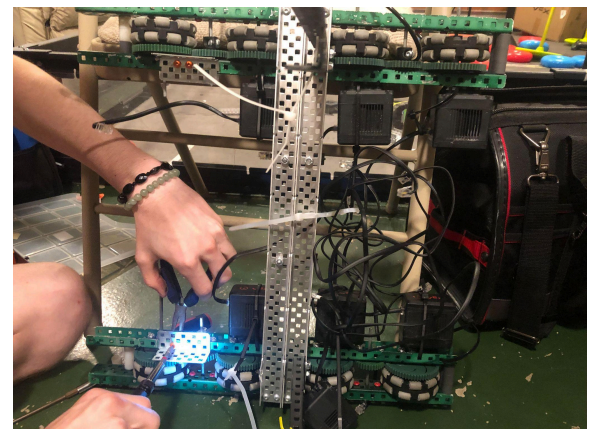


Wheelbase

We built a prototype wheelbase early in the season, however, we quickly found many flaws with it.

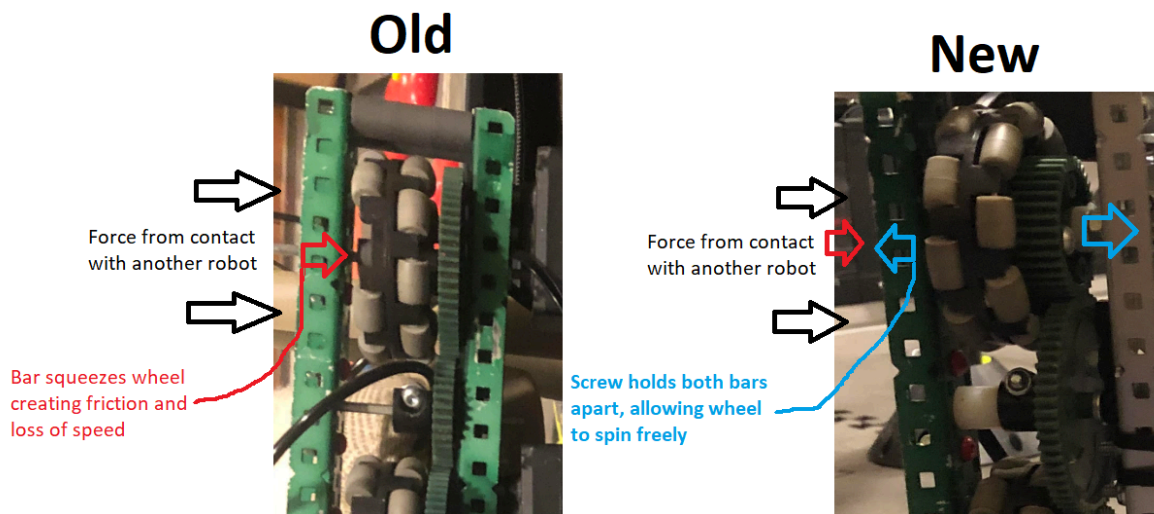
1: Wheels were shifted to the front to help the mobile goals get into position, but we found it would be more useful to shift the rings instead.

2: The frame was not sturdy enough and would twist and bend.



3: It was geared for torque which would be useful, but was simply far too slow.

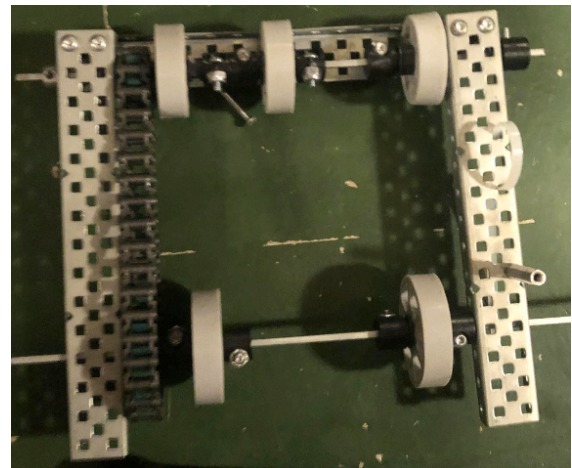
To fix these issues, we reinforced the wheelbase and shifted the wheels to the rear. We also used a tip suggested by the team in China, where you use screws instead of axles for the wheels. This allows the robot to not lose speed when bumped from the side, as well as making the whole wheelbase much sturdier.



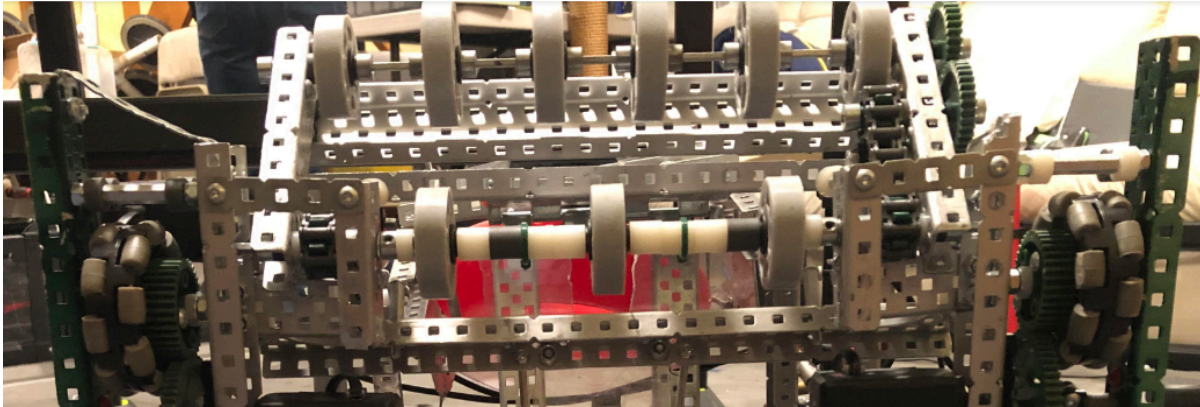
We also changed the gear ratio from 36:60 to 60:36, which gives our wheelbase much-needed maneuverability and speed.

Lower intake

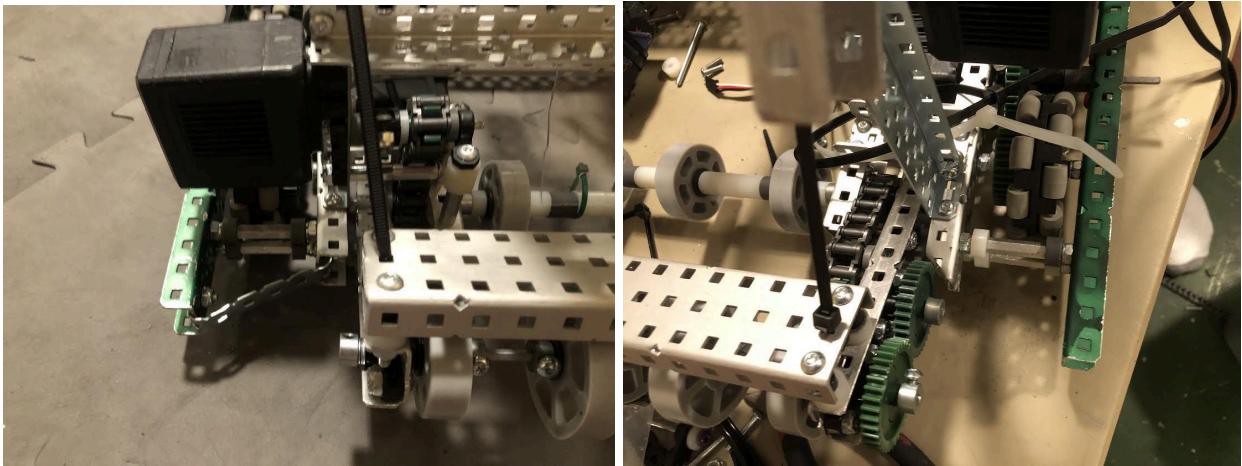
Originally we had an intake that sucked the rings up on a ramp-like most other teams. However, we had many troubles with the intake not having enough power to intake the rings. We decided to leave it off for the time being and worked on other parts of the robot. At the same time, James was working on improving the scrimmage robot and designed a unique intake on that bot that worked amazingly, so we copied it and put it on the main robot.

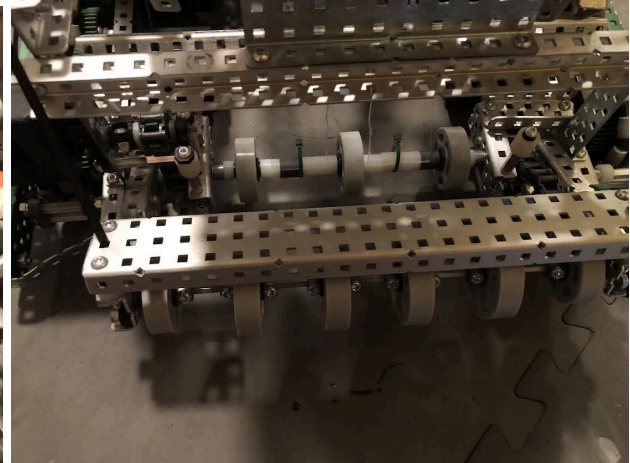
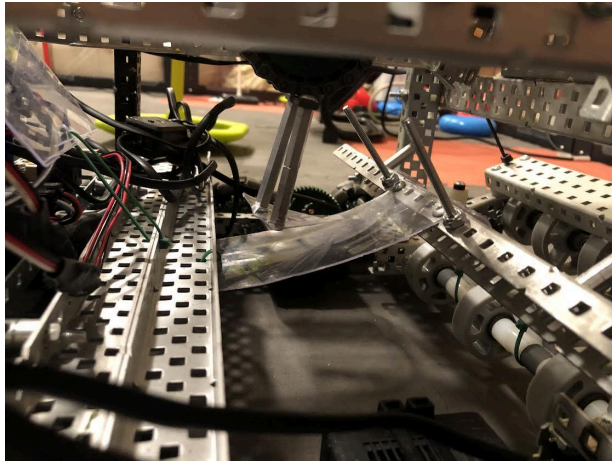


(Underside view)



The intake uses a top row of flex wheels to suck rings in, and a smaller bottom row that spins in the opposite direction to lift the rings for the upper part of the intake to hook onto. We found that the wheels can't spin as fast, because the motor has to spin 2 axles. However, this intake has absolutely no issues with clipping or getting stuck on the floor of the field.



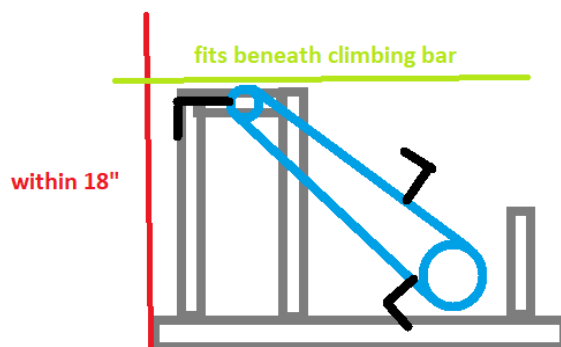
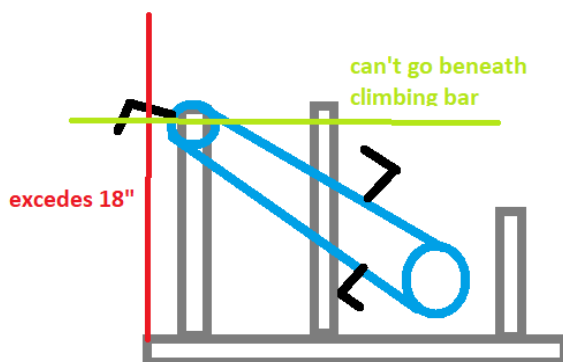


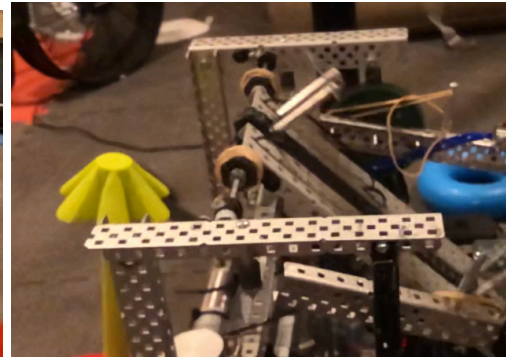
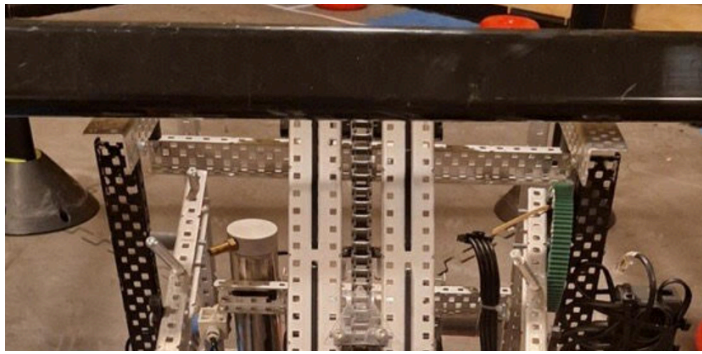
A new challenge - size

We had another get-together for 3 days to work on the robot. We had to make multiple design changes to make the robot fit within 18 inches. We found that the hooks on the upper intake would probably count as exceeding 18 inches when they were at the end of the chain. To fix this, we had to move the end of the chain back, which meant we also had to remake the guide bars on the intake and make the goal clamp tilt the goal more.

Old

New

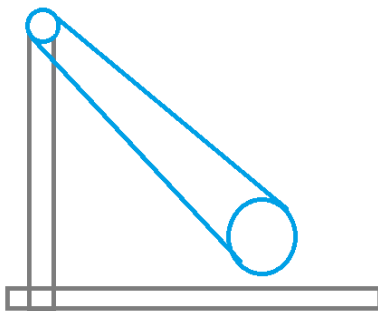




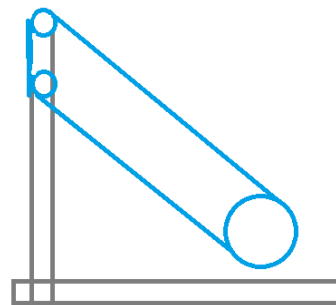
Since we were remaking the upper intake, we also decided to lower it a bit so that it could fit under the climbing bar.

We also looked at some reveals, and noticed that everyone else had hooks that would go straight down for a bit before continuing back around the chain.

our intake

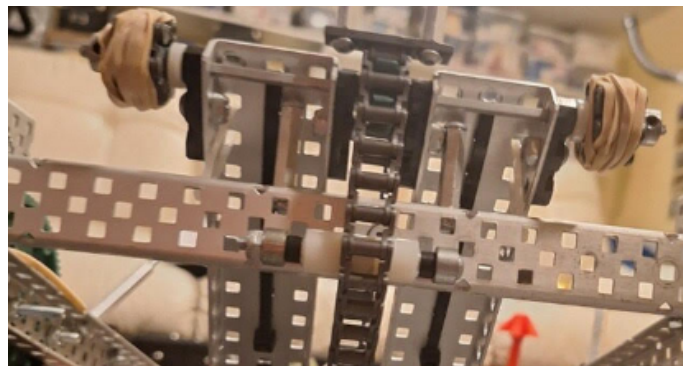


**everyone else's
intakes**

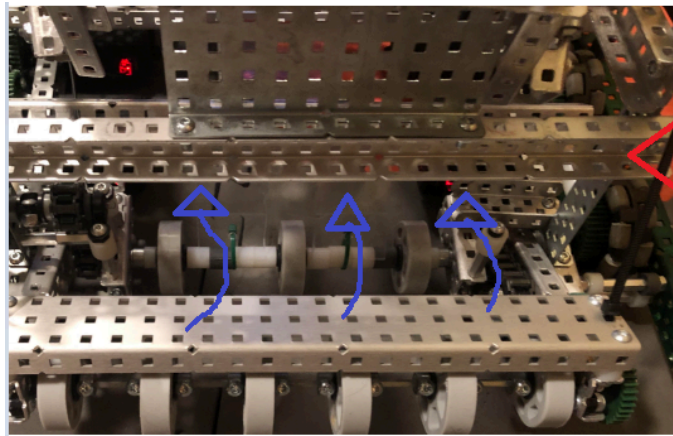


We did some testing and found that the hook going down afterward helped the rings get on the goal because the hook would not only flip the ring onto the goal but also push it down past the top rubber thingy.

After learning this, we also decided to use this technique. We used some spacers with a screw through them for a super low friction roller to extend the chain.

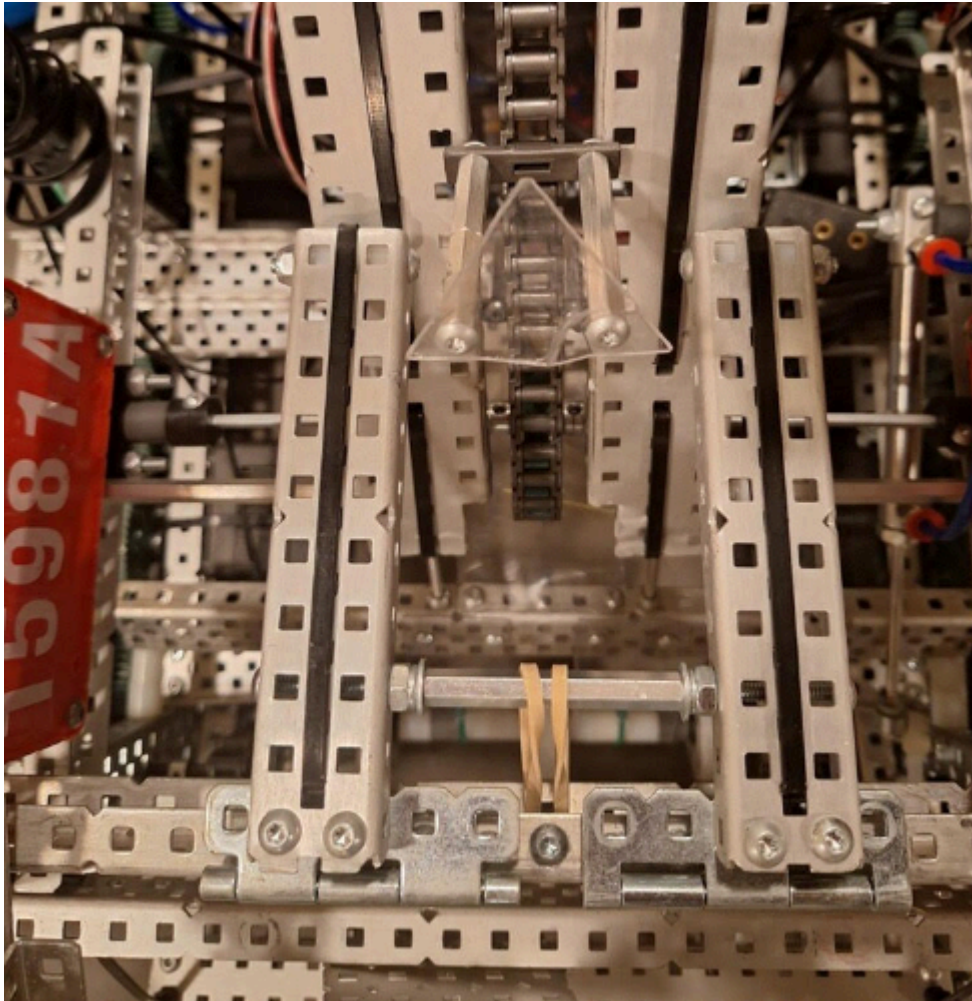


We also found that the front part of the intake also went past 18 inches, even while it was pushed up all the way. In order to push it back enough, we had to remove a bar on the front of the robot.



Bar prevents intake from lifting up, causing it to extend beyond 18"

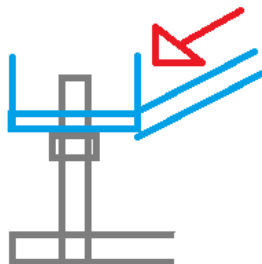
We removed the bar and replaced it 4 spaces higher than it was before. This solved the problem of the intake, while still keeping structural integrity. However, this now caused the mechanism that allowed rings to slide into the hopper to not work. We then remade the mechanism, with much less friction and a rubber band tensioner.



We overlooked another problem caused by the raising of the bar, however: The hopper rests on this bar, and now that it was raised, the hopper's lowest resting position was also raised. This meant that the rings now had a much harder time sliding into the hopper, as they no longer had gravity to help them along.

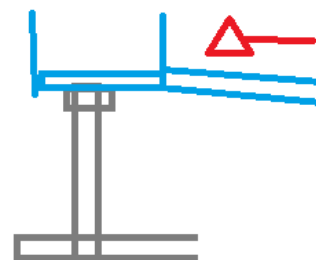
Before

rings slide in with gravity



After

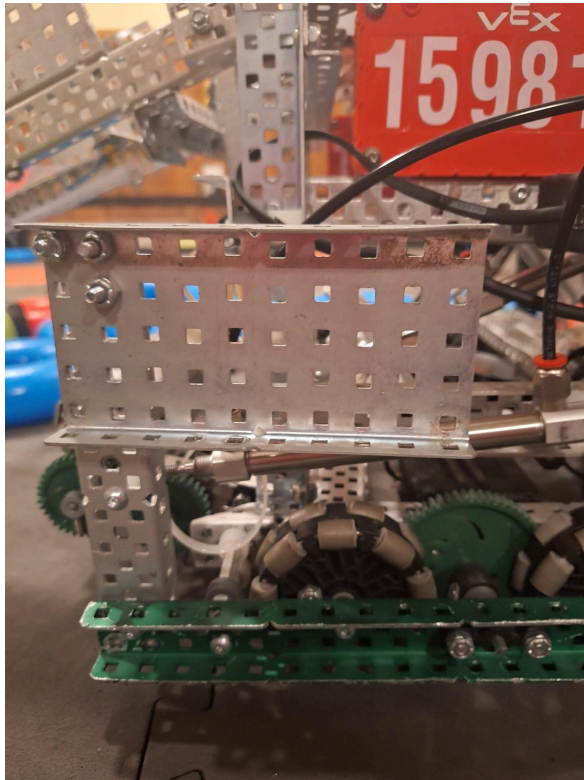
rings get stuck

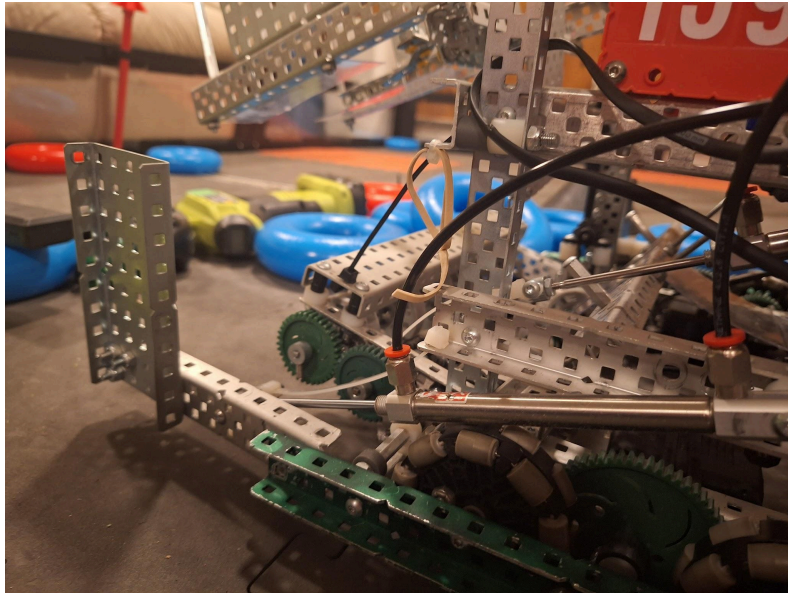


We are still working on a solution to this problem, although we expect that we can chain some kind of wheel or tread to help push the rings in.

Removing Corner Rings

Another thing we added was a way to remove rings from a corner



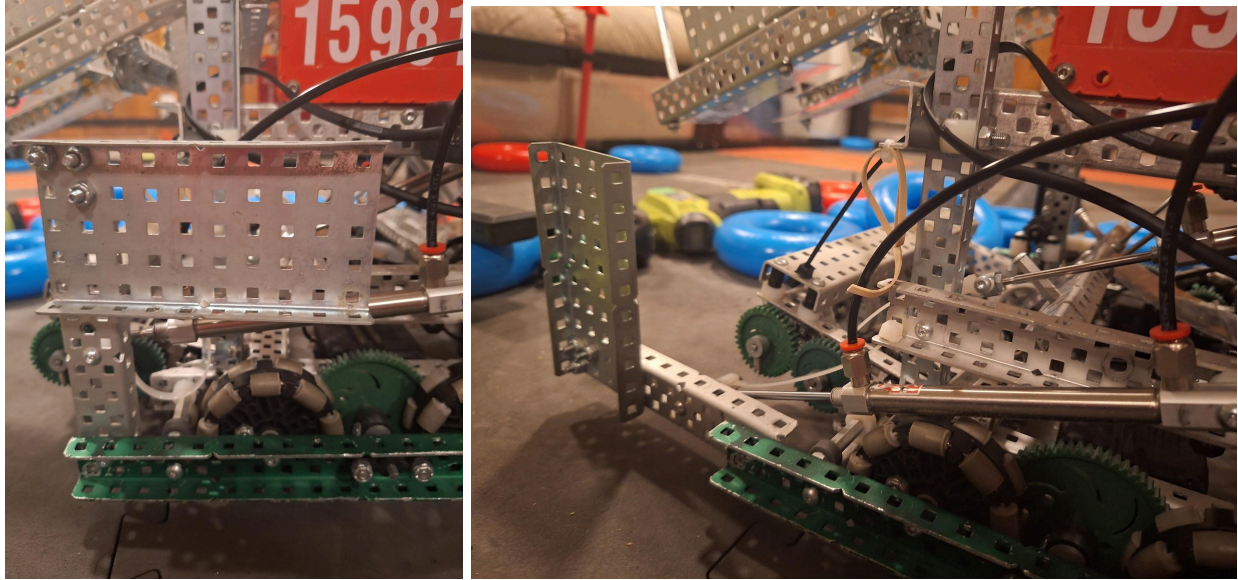


This was also highly successful. However, we needed to test it so we stacked some rings and tried to push them, at first we had trouble leveraging against the rings as they were slippery but we added a c-channel going up and it worked much better. See the next page for more details.



As you can see the top ring is taller than the bar and that means that the top ring can flop, which is a problem without a fix for now. But it isn't that big of a deal as it only delays a second.

We also made a simple arm that flips down on the left side of the robot to clear away rings in the corner of the field so that we can put down a mobile goal.



We also added a piston that pulls up the intake when we want to either pick up the top disc on a pile of 2, or we want to clear out a corner with the arm.

9/9/24:

Attendance:

1. Andy
2. Dan
3. James
4. Meelia
5. Finley
6. Bella

Today was devoted to practicing both driving and practicing judge's interviews, both crucial things for the success of the event. The judges at the signature event will be much more stringent than at other tournaments

9/16/24:

Attendance:

1. Andy
2. Dan
3. James
4. Finley
5. Meelia
6. Bella

Practice interviews, more practice, drive team practice, logos

List to do.

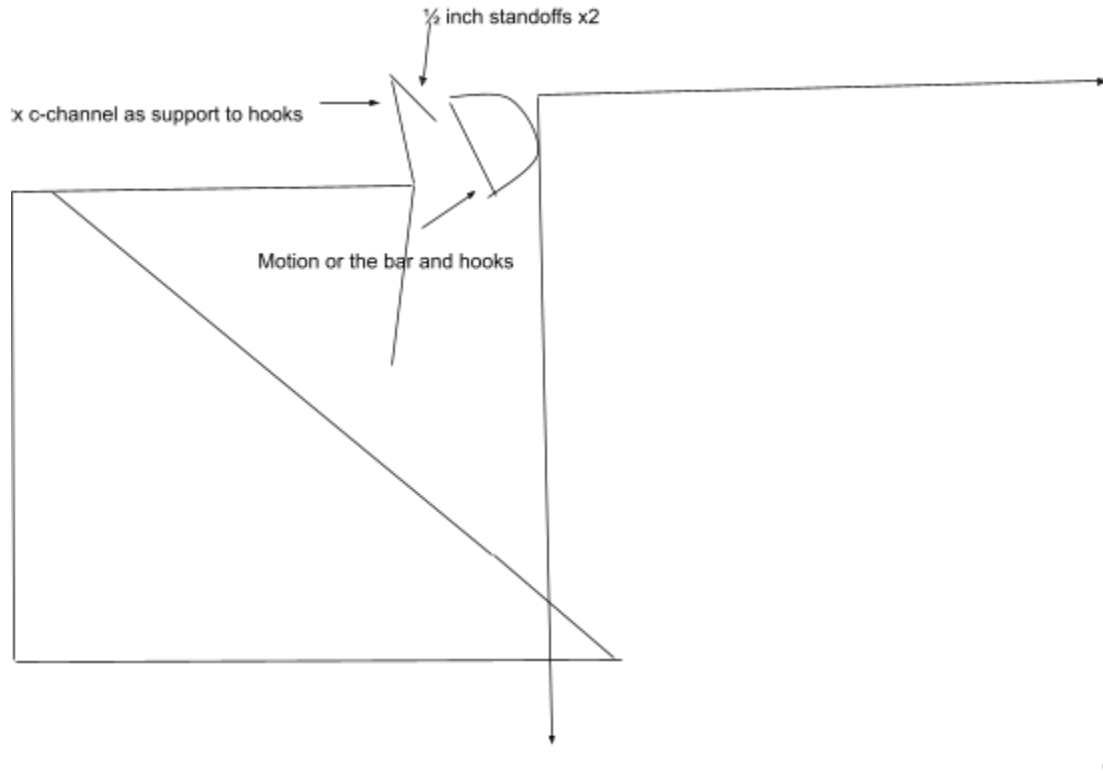
1. Move the hopper to fit within 18 inches.
2. Band hopper
3. Practice
4. put decal mounts on
5. Fix hopper motor
6. Do climb
7. Work on auton

Most of what we had to do involved coding auton but we realized halfway through that the hopper not only started the match outside 18 inches(the size limit) but extended more than 6 inches outside the robot(the expansion limit). We created an image to show what we had to do. See below.



However as the build team worked on this we realized that it would only work in auton even if we did all these changes, we began to wonder if a climbing mech would be better and so we designed one.

I think that we may have discovered a tier 1 climb that works by just driving forward and then hanging about a half-inch off the ground. See below for the design



This design would rely on the wheelbase to drive up the ladder and then two hooks would hold the robot there. I did some beta testing and it just made sense to take off the hopper for our first competition.

Pros and cons of the hopper:

Pros

Score on wall stakes

Helps in auton

Knock over mobile goals

Cons

not working yet

takes a while to code

knocked over goals are not descored

Gets in the way of the main intake

Can't score on main wall stakes

Pros and cons of the climbing mech:

Pros

Easy to control

Would take very little time

Easy 3 points

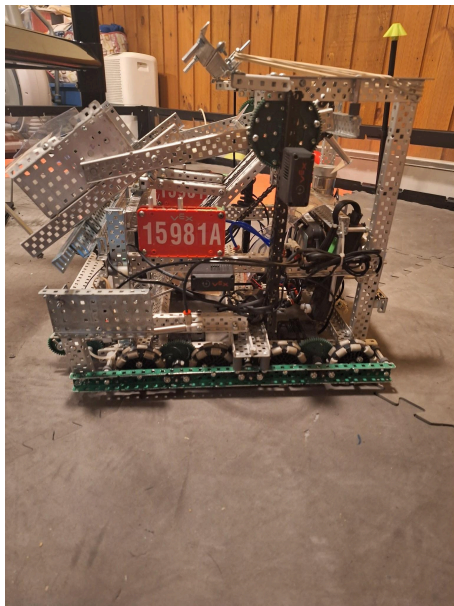
Cons

it's late to add anything

if deployed early we can't go under the ladder

The way it would work is that rubber bands would try to pull the mech up but the pneumatics piston would stop it when you retract the piston it would deploy. We were worried that the robot would then be tall enough to go under the ladder but when we measured it didn't seem that way.

When we built it it worked well, however the back of the robot had too much weight on it to climb so we added some steel to the front of the robot to counter it.

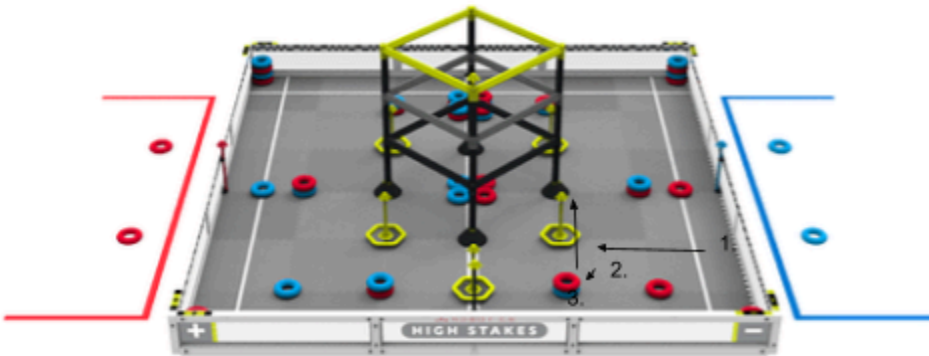


The climb mech worked great after we added weight, the weight is the key part to the whole thing.

For the auton, we have a two-disk auton.

Auton route for Highlander Summit

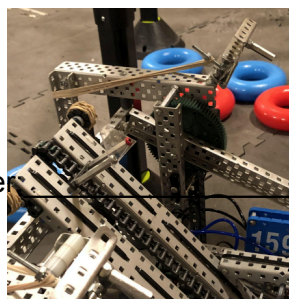
- 1.back up to pick up mobile goal
2. Pick up ring and put that and preload on goal
- 3.touch middle for win point



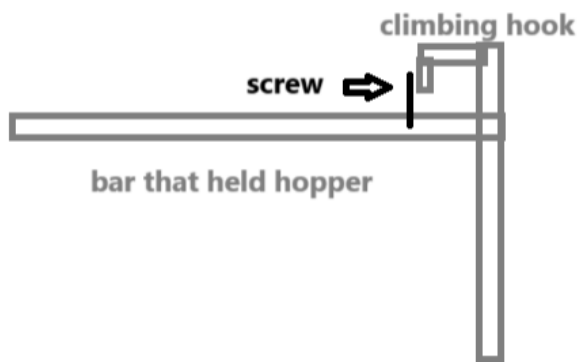
This is the auton we have for this event. It is simple but it is half the win point and that is something. After this event, we want to make an auton skills and a solo win point for the next event on December 14.

We thought about a design change to the hopper that could help rings slide into it, however, since we were short on time we decided to wait until after the signature event. In the meantime, we spent a lot of the session ironing out problems with the code.

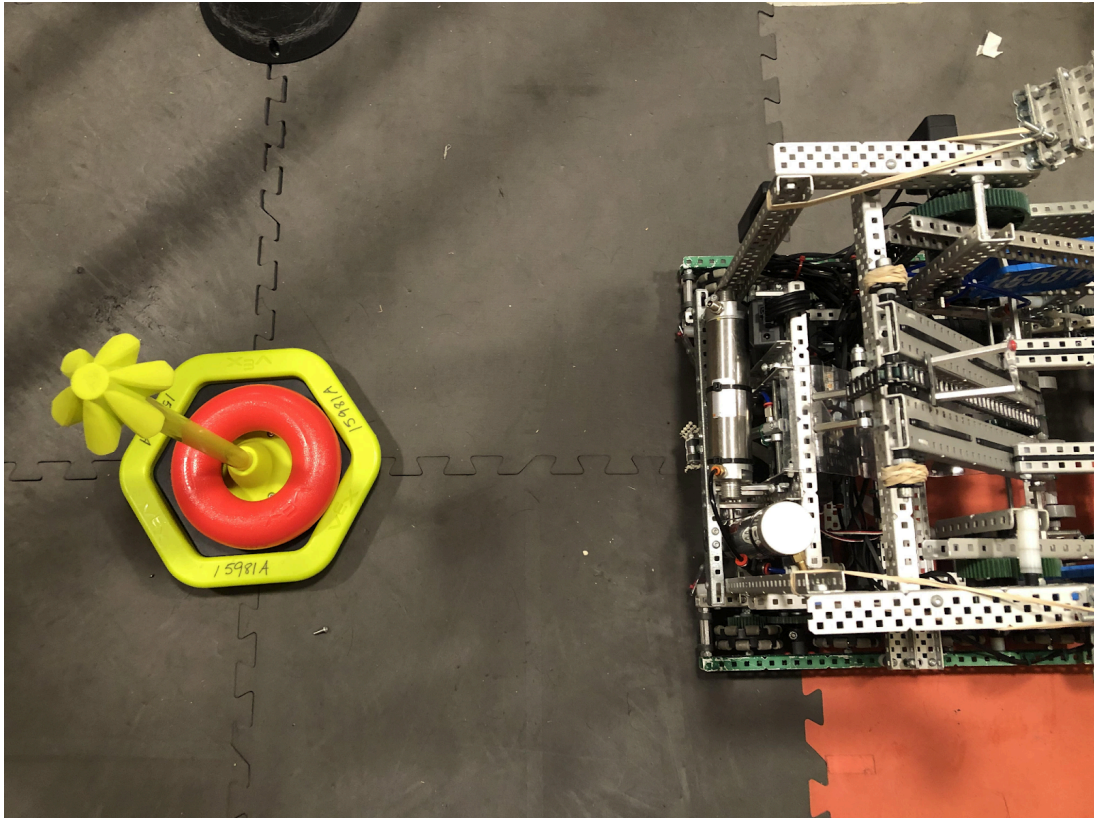
Today we added a climbing mechanism that flipped out using a pneumatics piston and allowed the robot to hang on the lowest climbing bar.

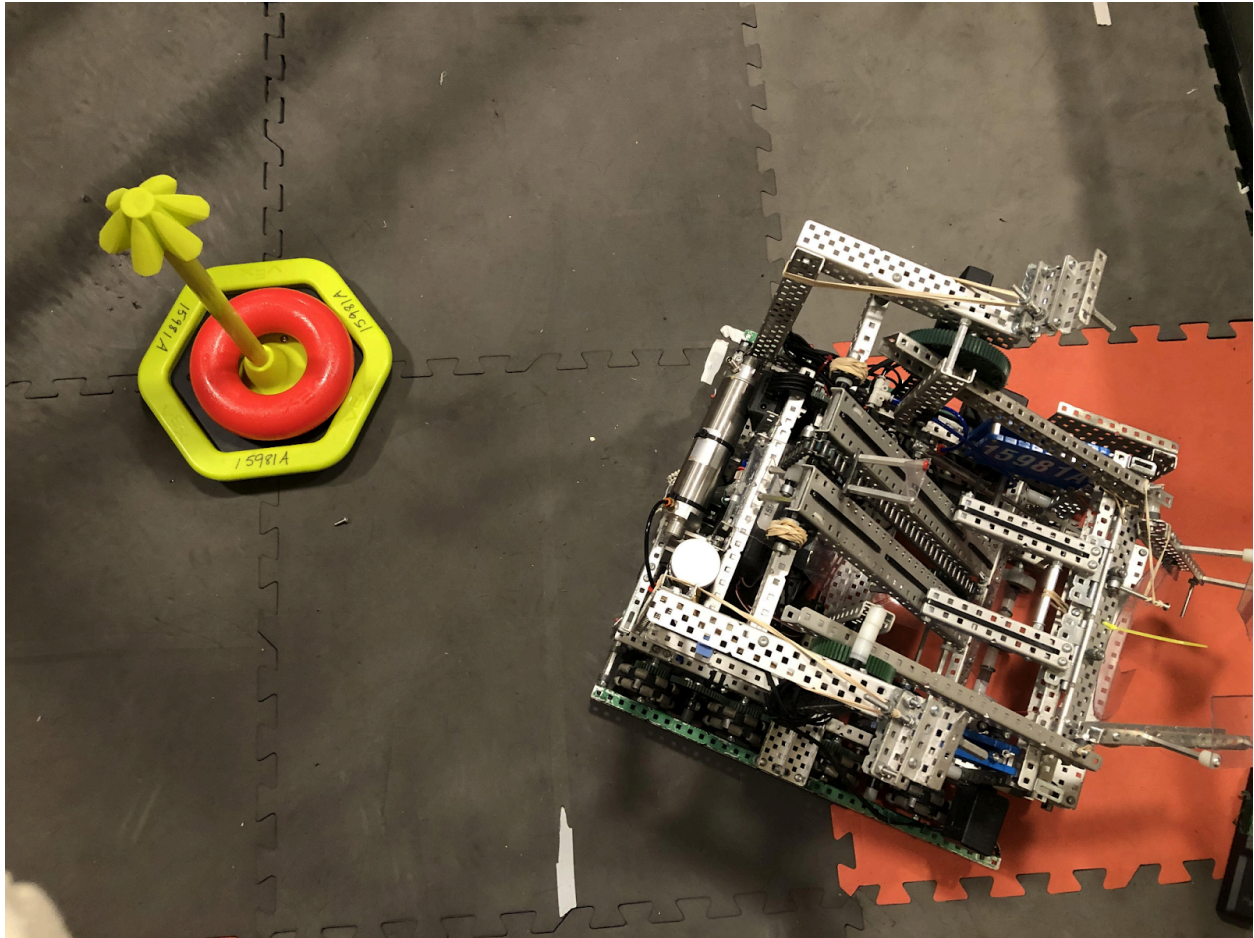


This climbing bar unfortunately limited the range of our hopper and prevented it from folding up so it would be outside 18 inches. We therefore decided to remove the hopper temporarily and reattach it after the signature event. We also found that, with a singular screw, the bar that formerly lifted the hopper could be used as a release mechanism for the climbing bar, allowing us to remove the pneumatics piston.

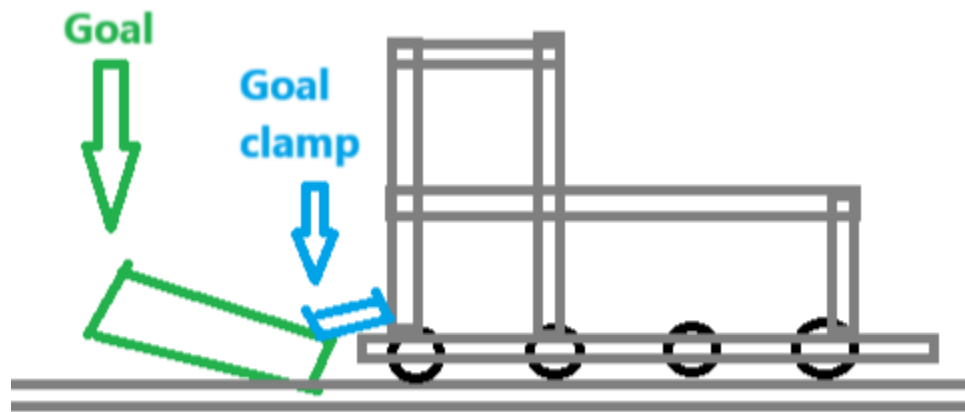


We worked on bug-fixing the code, and making an autonomous. We had trouble with our old autonomous because of the rule change that faces the pointy side of the mobile goal towards our original starting position, however, we found that by placing the robot to the side it could still clamp onto the flat side of the mobile goal.

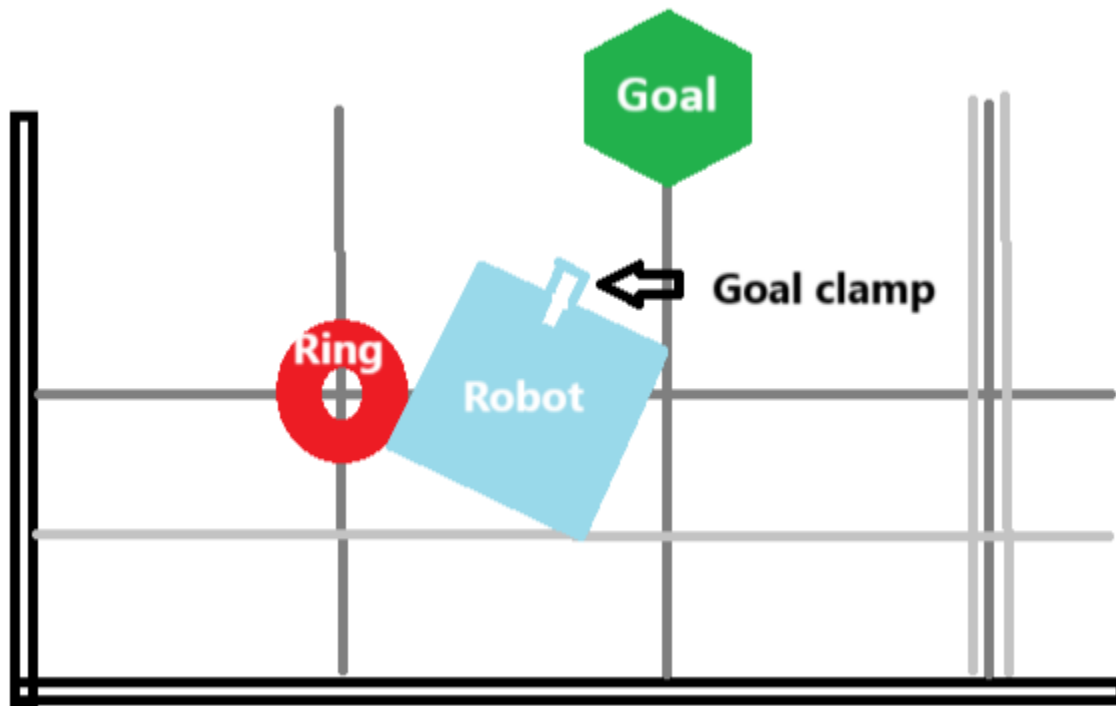




We continued making the autonomous code, and now have one working for the left side of the field, which we can later adjust to also work for the right side. A small problem we ran into was that the robot moves slower when holding a mobile goal, because it contacts the floor.



This means that if the robot misses the mobile goal, the entire rest of the autonomous fails, and we will drive off into our teammate's side of the field. This meant we had to develop a concrete way of positioning our robot at the start of the match. We originally thought about using a tool made out of c channel, however we found out that we could place the robot according to the diagram below, then use the chain on our ring hooks to align it with the mobile goal.



9/20/24 - 9/22/24(Highlander Event):

Attendance:

1. Andy
2. Dan
3. James
4. Finley
5. Meelia

This weekend was the Highlander signature event we went to New Jersey on Friday afternoon



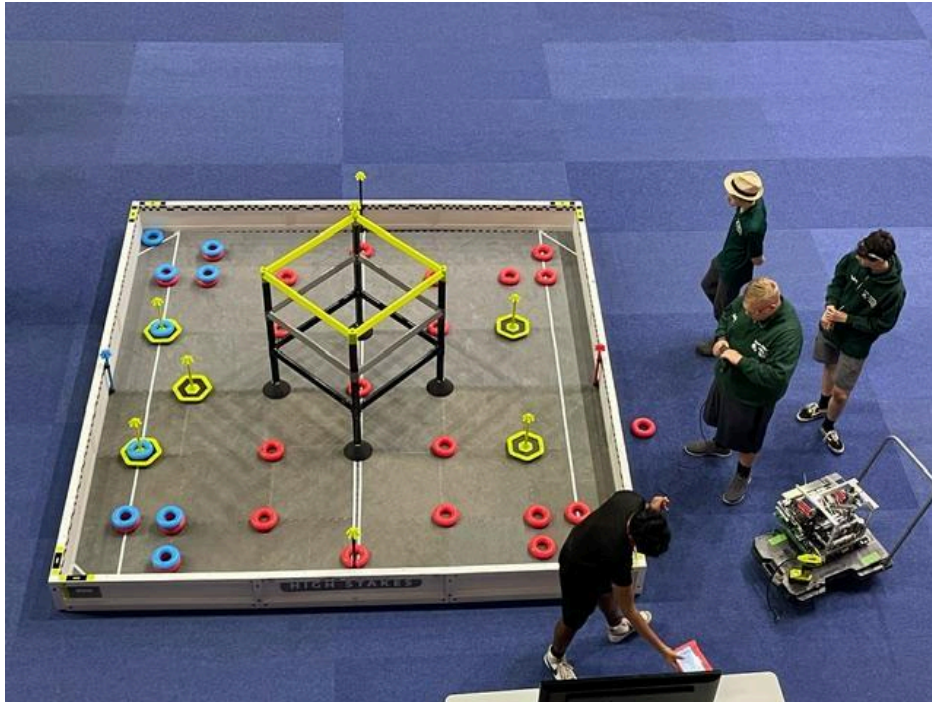
and went to the event right away, this was the first competition that we had ever been to where the robot was done, we immediately saw that most of the teams equaled or outmatched us but our hopes were high, the first thing we did was set up our table.



After that, we decided to scout out some teams and talk to people. We had one of our teammates wait in line for the practice field. Because there were 80 teams it was a long line



We had to do skills also so we headed down to the skills field and did our first run.



Then we started to get tired and we went back to the Airbnb we rented for the weekend and had a team meeting. We talked about strategy and driving team roles.



Then we relaxed.

We realized that this competition was really important to the rest of the season because if we learned a lot here we could potentially do really well the rest of the season.

We woke up early the next morning, had some coffee and hit the road. We arrived at about 8 am to find most of the teams already there. We went to the drivers meeting really early. We had a team meeting and got ready for some matches,



Then after 4 months of getting ready, it was finally time to play some matches. We were talking to our alliance partners

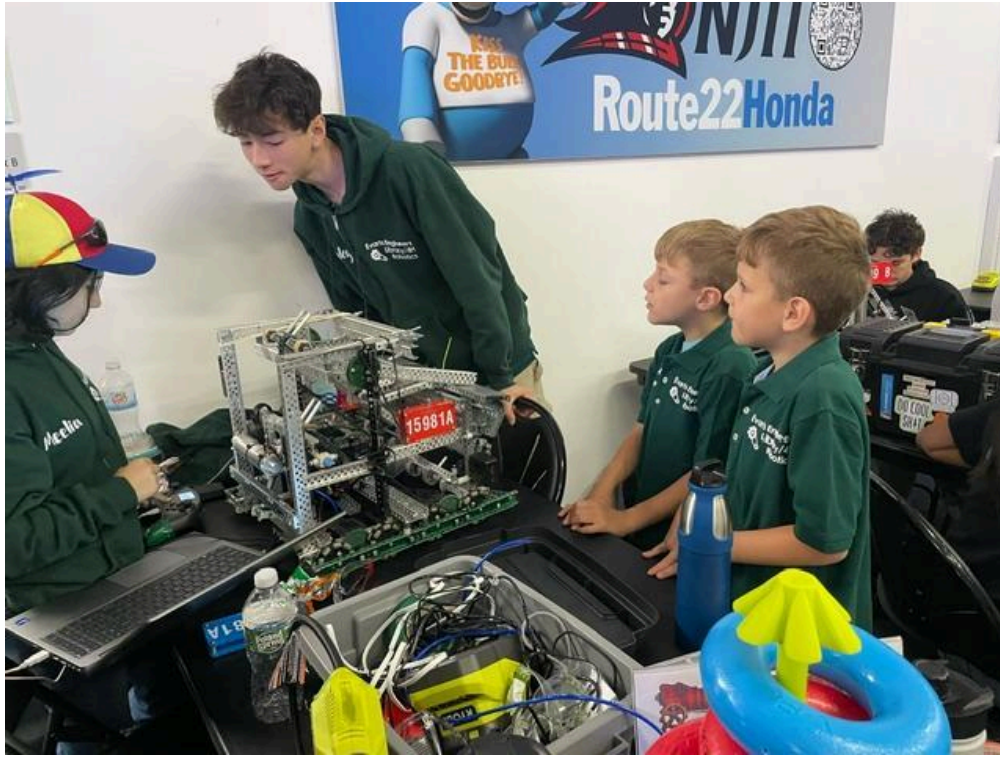


Then it was time to fill our air tanks.



We were playing very well after the first two matches.

Around noon the team's young friends came and learned about the robot. This was good practice for the team's judges' interview.



They then stayed to watch a couple of our matches, we then went to get dinner, came back, and did more.

Then it was back to the Airbnb to work on the robot. We wanted to get the Auton Win Point(which is achieved by completing a set of tasks). One of those tasks was scoring on the wall stake, which we couldn't do. So we worked until almost midnight on a hopper design to score on the wall stake (we needed to score one on a mobile goal and one on the alliance wall stake.)



This is what every Airbnb owner wants to see, it being put to good use. When the hopper was complete we went to bed and woke up even earlier the next morning. We finished our matches and went home that afternoon.



Results:

We won three out of 8 matches and finished 52 out of 79 see below for our match scores.

The Highlander Summit VEX V5 Robotics Competition Signature Event

Qualifier #17	Sep 21st at 11:33 AM	15981A	4478B	11	2616X	2072X	35
Qualifier #34	Sep 21st at 2:01 PM	4478U	4610W	26	1357X	15981A	24
Qualifier #48	Sep 21st at 2:48 PM	4024V	119B	35	2072C	15981A	11
Qualifier #59	Sep 21st at 3:26 PM	15981A	7405K	39	2055A	197B	30
Qualifier #77	Sep 21st at 4:30 PM	15981A	9364D	14	70407R	7405V	35
Qualifier #109	Sep 22nd at 8:23 AM	23382H	839Z	12	15981A	9364A	42
Qualifier #121	Sep 22nd at 9:04 AM	15981A	765C	7	25565A	16099B	35
Qualifier #133	Sep 22nd at 9:43 AM	50805H	66475C	31	62880D	15981A	25

Rank

52

WP / AP / SP

7 / 12 / 134

As you can see we could have done a lot better but we were very happy because we rarely win that many matches.

In terms of skills we didn't do so well, we scored 15 drivers and 0 auton. We are going to practice this and our coder (Bella) will work on auton skills

Problems with the robot:

1. Mobile goal clamp took a while to clamp on
2. Intake sometimes got stuck
3. Climb mech sometimes didn't work
4. When we were clamped to a mobile goal, drive was slow

Things that worked well on the robot

1. Intake was very very consistent
2. By the end, the climb was very consistent
3. Our drivers did well
4. We met a bunch of teams

What we learned:

We gained valuable insight into how the gameplay of high stakes will work. We also had the opportunity to practice with 4 robots on the field. We know what we want to do before the next competition.

List of things we want to get done and who will do it

1. New mobile goal clamp(James)
2. New climb mech release(Dan)
3. Wall stake scoring mech(Andy)
4. CAD of robot(James)
5. Move brain to center weight(Andy)
6. Odometry Pods(Finley)
7. General code(Meelia)
8. Auton skills(Bella)
9. New decals(Dan)
10. Plexiglass ring shield(Dan)

As you can see it is an extensive list of stuff we want to work on. The reason we even went to the competition was to get an idea of what we needed to work on. On the whole, it was a complete success. We want to do it again next year which is nice.

Event: Signature Event in New Jersey		Date: 9/20/24 - 9/22/24
Results: • We placed #52 out of 75 teams. • Completed Qualification rounds, we did not make it to the Elimination rounds as we were not selected for an alliance. • Met many new teams and made personal bonds with new people we've met. • Competed well in qualification matches, ending with ◦ WP: 7 ◦ AP:12 ◦ SP: 134. • No disqualifications during qualification matches, nor warnings due to rule breaks. • Found inspiration from designs presented by other teams.	Key Takeaways: • The rules presented at signature events are not the same as those in regular events, signature events have slightly altered rules making them more difficult. • Game rules may change at the drop of a hat, and thus we must be prepared to change up gameplay as needed to fit rules. • We need to improve on the distribution of discussion during interviews as either one or two members talked during the whole time while the others stood silent. • After a unanimous decision, new designs need to be made for the robot. • Weight still needs to be added to the front as the climbing mechanism, while improved, still has some difficulty operating with a 70 - 75% success rate. Increasing this rate will improve our chances of gaining climb points.	Priorities: ☐ Interview Skills ☐ Autonomous Solidification ☐ Adapting game strategies ☐ Making new decals ☐ Adding inspiration from other teams to the robot

	• Autonomous is near perfection, there is still some space for improvement.	
Conclusion and Next Steps: The Signature Event in New Jersey fared well for the team members of 15981A. We may have not won the competition or gotten in elimination rounds, however we observed new strategies, took inspiration from designs presented by other teams, and got a head start amongst other teams in terms of win points. Starting the regular competitions with experience from a competition already will give us a step forward in terms of strategy, interviewing, and team skills this season. This signature event has opened up both opportunities and areas of growth. We found that we need to distribute air time during interviews, so not only one or two people or talking and all members have something to say during interviews with the judges. As well as just working on interviewing with some out of session practices. Another area of growth is working on the climbing mechanic. The climbing mechanism has come a long way, just adding a few plates of steel to the front will increase the chances for a successful climb. Autonomous needs some minor tweaks, and a tool must be made in order to perfectly align the robot so a perfect autonomous can be conducted. Much like last year's F and E - tools. As well as new decals for the robot. There have been many takeaways from this event, noticed and acknowledged by November 9th we will be ready to compete once again.		

9/30/24:

Attendance:

1. Andy
2. James
3. Dan
4. Meelia
5. Bella
6. Sofia

We started out today by talking about the next steps we wanted to do for the robot and reflecting on the tournament and how far we came. We decided we needed two things: number 1, the robot was kind of falling apart as a result of the tournament and it had many minor issues that needed improvement, so we thought of a solution to this problem: build a second robot, the same but with many minor improvements such as a slightly improved goal clamp, tighter screws (literally everything was loose from the signature event thanks to our defensive strategy), and also a very much improved hopper mechanism to score on wall stakes which is the second thing we prioritized. One would say why not just take the parts of the old robot and fix them individually then reattach them, but that gets us to the main benefit of this solution, the coding team can code with the old robot while the build team makes the new one and all the controls and everything will all be the same so we can just transfer the code over.

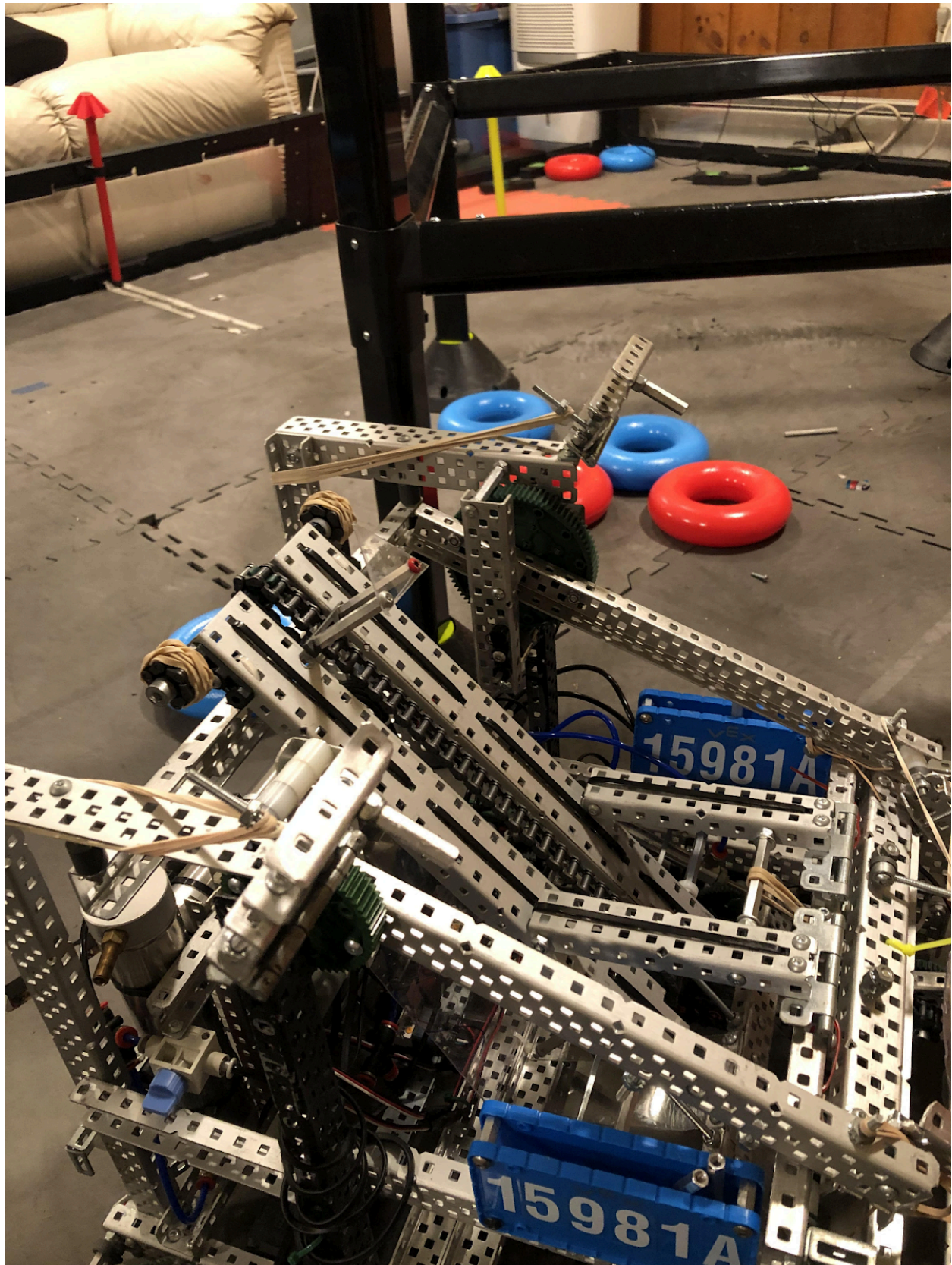
After we got our priorities straight and had a solid roadmap for what we wanted to accomplish by the next tournament we split up into 3 groups, one to code, one to rebuild the robot, and one to build a hopper mechanism.

10/7/24:

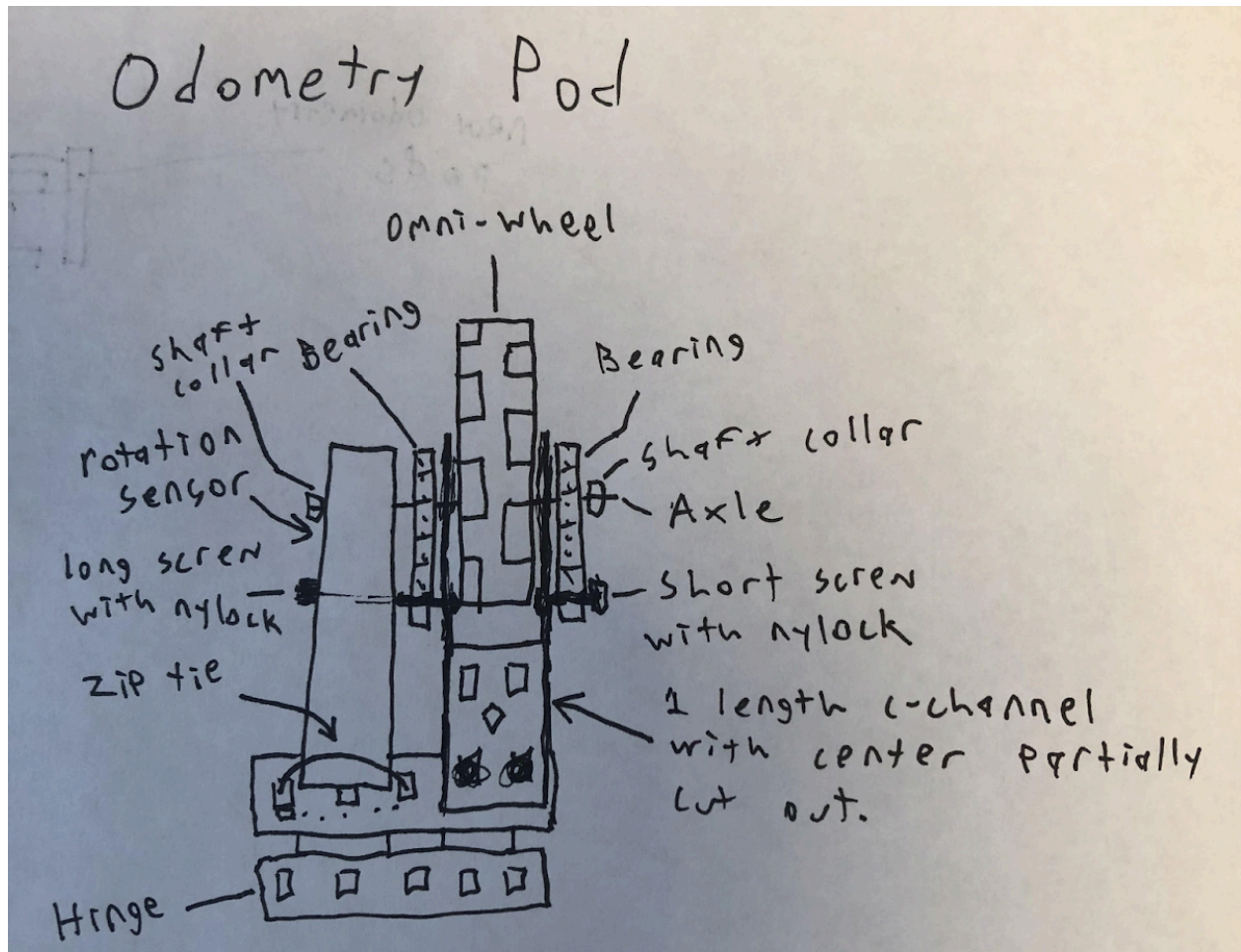
Attendance:

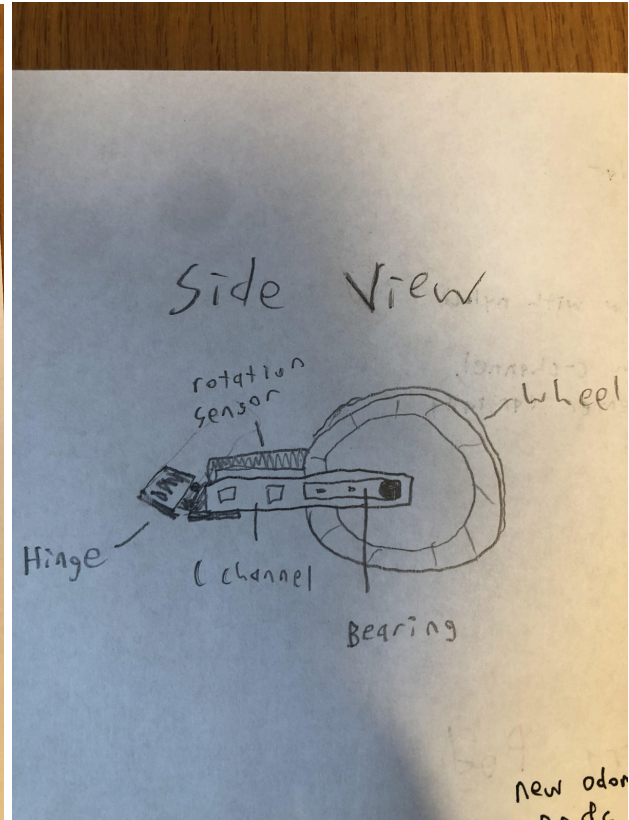
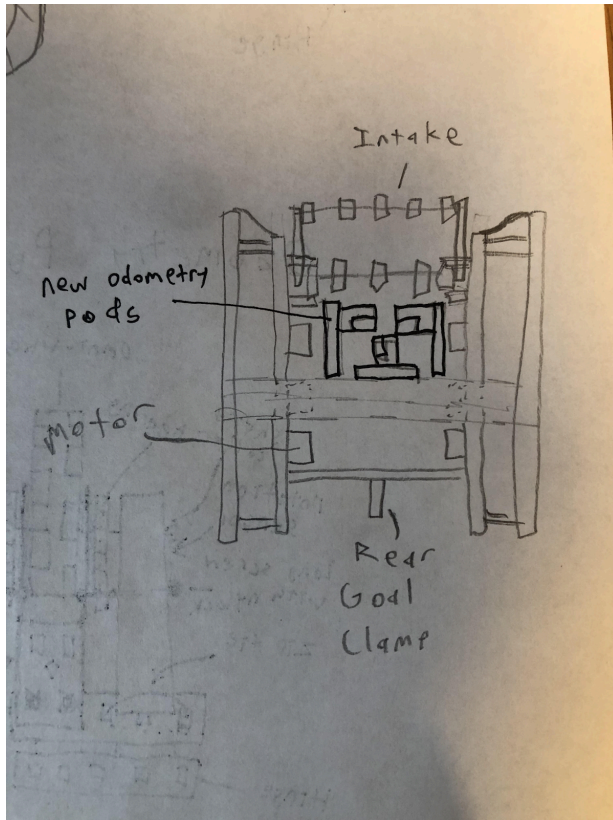
1. Andy
2. Finley
3. James
4. Dan
5. Sofia
6. Meelia
7. Bella

During the competition, we made some small tweaks, such as removing part of the climbing hook bar so as to move it back 3 spaces and make the robot more balanced when hanging. We also had to use a Dremel to grind about $\frac{1}{8}$ inches off of the goal clamp so that it would fit within 18 inches when fully extended.

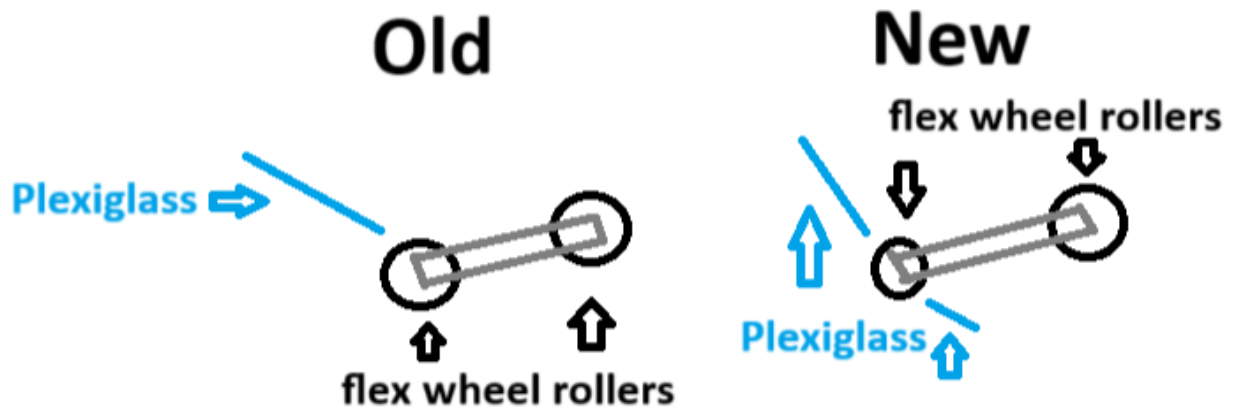


After the competition, we decided to copy the robot so that we could practice properly (the former practice robot was just a pushbot). This would also help with driver training. We put in a parts order, but as usual, 3.25in Omni wheels were out of stock. We also decided to substitute the middle 2 omni wheels for grip wheels, for better pushing power. During the competition, we also learned more about PID and odometry, and we found that we could attach rotation sensors to our wheelbase and have a single odometry pod in the middle of the robot. We have some concerns about the wheelbase wheels slipping, and thus messing with the odometry, but we will just have to try it and see.

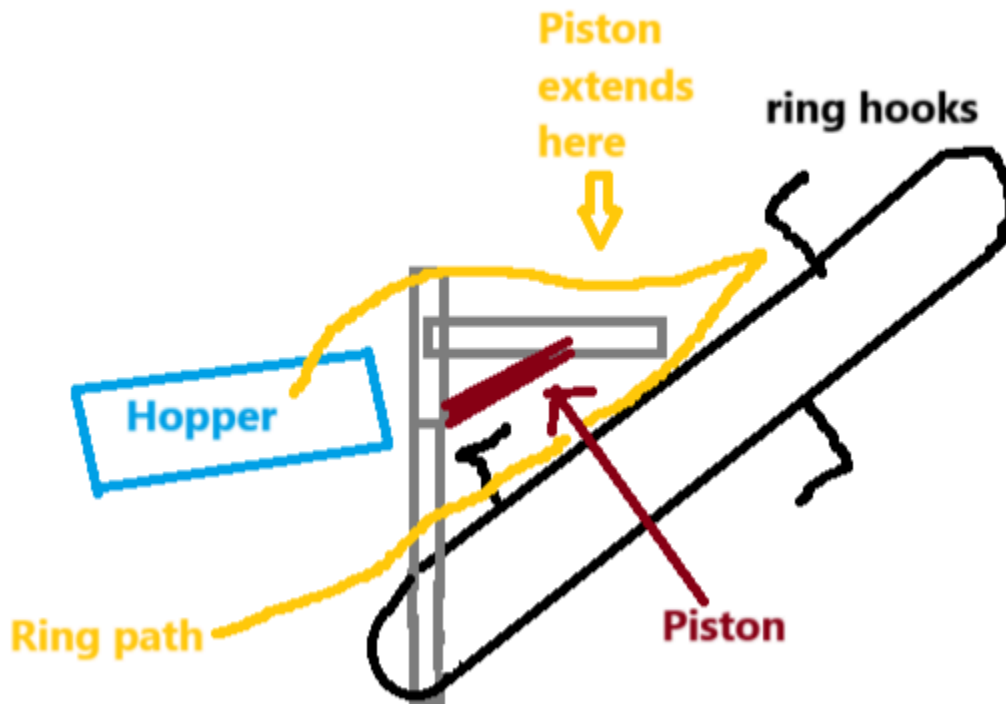




In the meantime, we began replicating the robot, using tricks we learned during the competition to improve it, such as using a small plexiglass ramp to help rings get into the intake.



Today we began preparing the robot for our next scrimmage in Fallsburg. We redid the pneumatics system so that the hopper and doinker could be controlled separately, as well as added a piston to help push rings into the hopper.



This will allow us to score more effectively, as we are seeing wall stakes are becoming more and more important in the meta. We are also thinking about using solid grip wheels on the center two wheels of the wheelbase, for better pushing power.

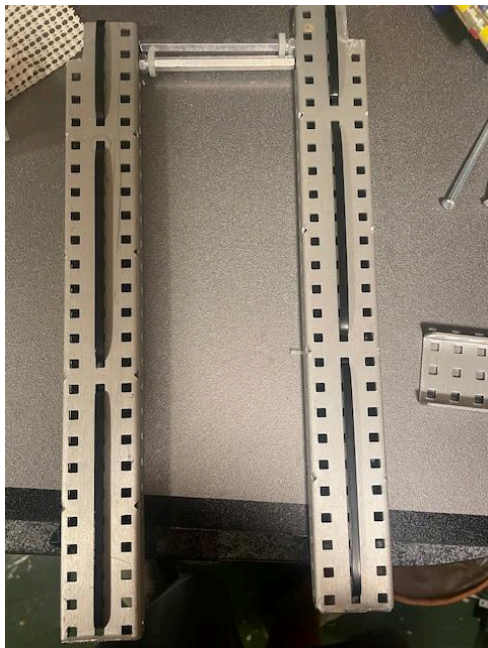
Today we continued to copy our robot. It wasn't a very productive session but we finished our planning for our sensors for the new robot, we are using 3 rotation sensors and 2 bumper switches.

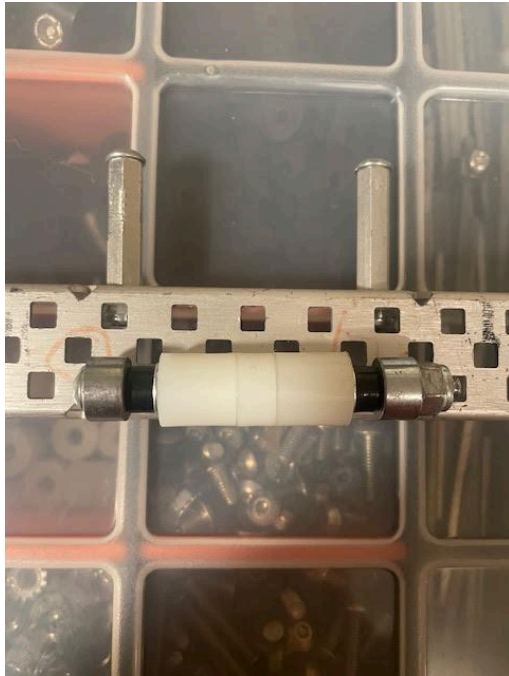
The work on the wheelbase went well we managed to add these cool things on the corner of the wheelbase, see below



These serve to make the robot not get stuck on the wall of the field.

We also worked on the top hook of the intake. We are not going to change this part of the robot but because we are changing goal clamps it may have to be fine-tuned. This is the progress we have made in that aspect.





This is the zero-friction tensioner. We originally had a normal tensioner, but that slowed down the intake too much, so we used nylon spacers to reduce friction. The chain would spin the spacers, and that made it spin just as fast as if there was nothing there.

The sensors that we plan to use are mainly to help in auton and to make it easier for the drivers (Andy and Finley). These are the sensors we plan to use

Rotation sensor:

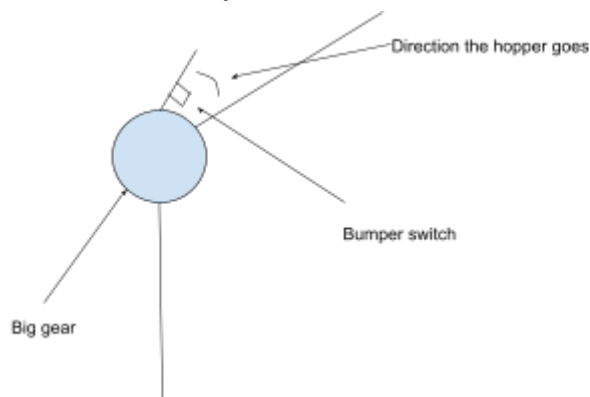


This helps with odometry, which measures rotation accurately. We will have three sensors. 2 on the front wheels and one in the pod.

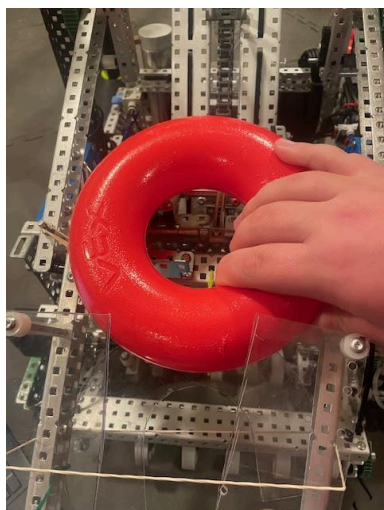
Bumper sensor:

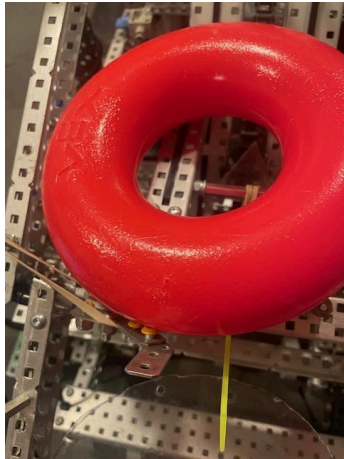


We are using this for the ease of driving for our drivers. One will go right on the goal clamp so that it clamps automatically. Which means the drivers don't have to press the button.

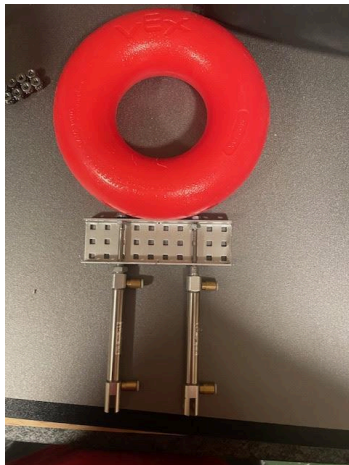


We had a team meeting and designed a mechanism that would make the disk go fully into the hopper, this is very subject to change. When the disk is stuck like this. It won't go into the hopper and that means that we can't score wall stakes except in auton.





This is the mechanism we designed.



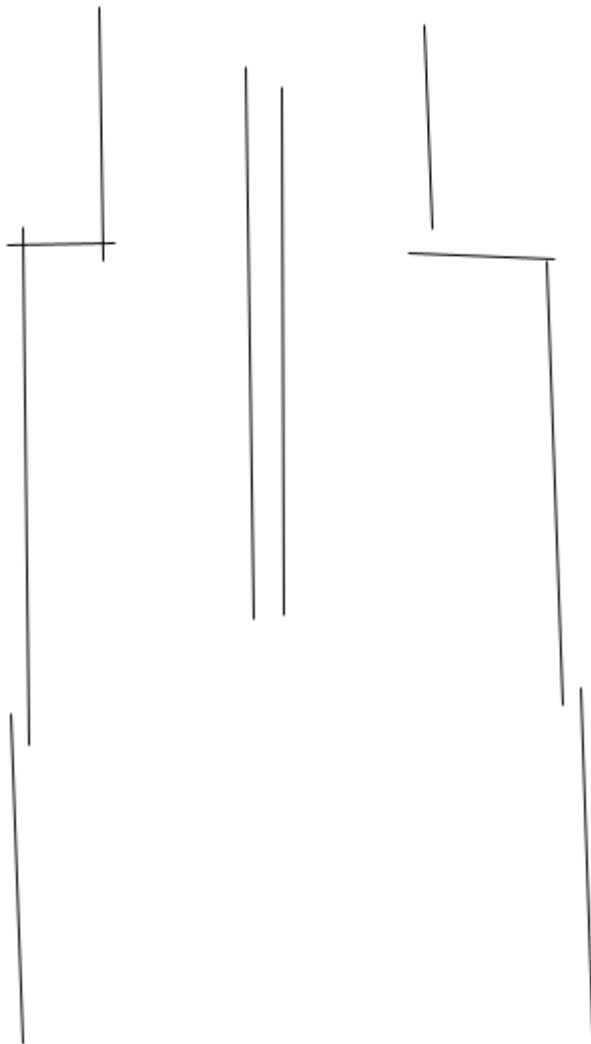
10/14/24:

Attendance;

1. Andy
2. Finley
3. James
4. Eben
5. Finley
6. Meelia
7. Bella
8. Sofia

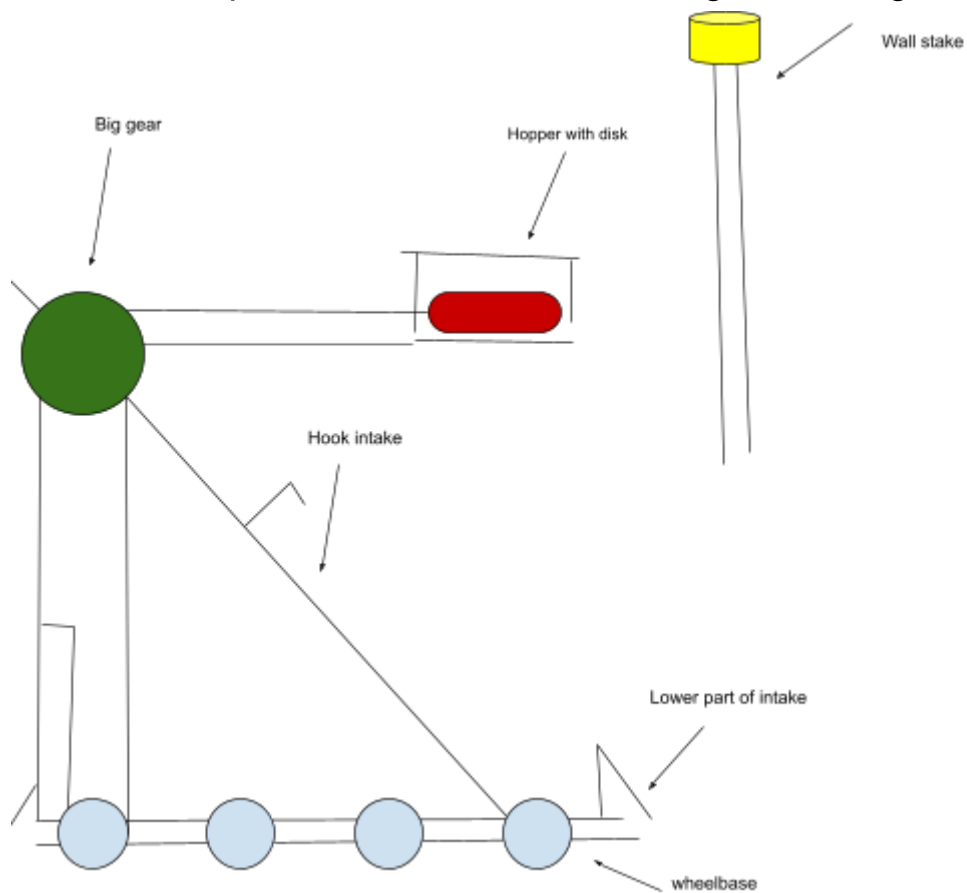
This is the design of the wall stake-scoring mech, the wall stakes have become an important part of this year's game, one that sways the results of games. We, after the competition, think it is crucial to be able to score wall stakes. It is my(Andy) job to design and build this mechanism.

I think that the most important part is that it is able to score fast. It only needs to score one ring because that would be the top ring and worth 3 points. The wall stake is a thing that if you have it will be a huge asset to your team's performance,



This is the outline of the hopper, but the inside is more detailed.

The hopper is powered by one half-powered motor. Most teams have at least one full-powered motor which is a huge advantage for us.



This is the basic design of the hopper. It is really simple but will be very efficient to use. We hope to have a working hopper by the end of October. We will use a piece of plexiglass to make the bottom of the hopper. It is geared from small gear to big gear to have enough power to raise only with one-half motor.

Goals:

1. Talk about the next steps of the robot.
2. Start to copy the robot.
3. Make a schedule for the road to the next tournament
4. Work on the hopper

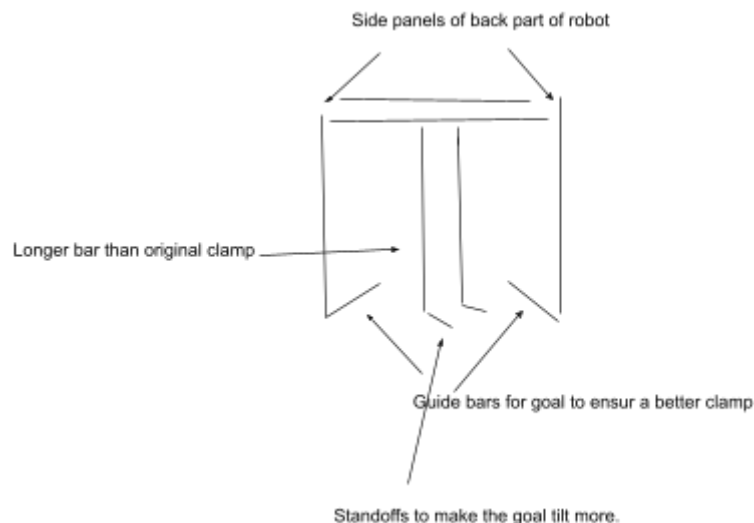
We met today for our normal weekly session but we have decided to do something a little different this year. Instead of rebuilding the robot to make the changes we want to make. We have decided to copy the robot and add some new things on it.

Things we want to add.

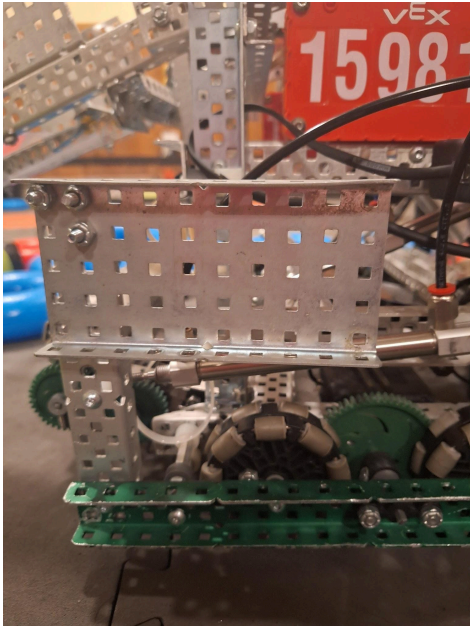
1. A new improved mobile goal clamp.
2. A better corner sweeper.
3. Odometry pods
4. Wall stake mech

1. Mobile goal clamp

It takes way too long to clamp onto a goal right now. Lining up the goal takes like 20 seconds which out of a 1:45 second driver control period is way too long. We want the clamping to take like 3 seconds.



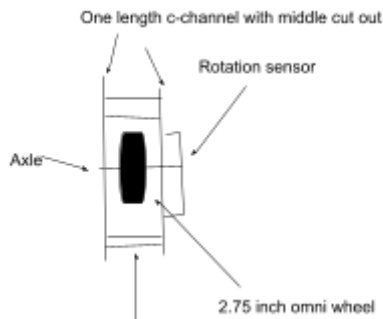
2. A better corner sweeper.



As you can see it is just a c-channel which means it has a lip on the end, this makes it hard to get behind the disks that are pushed up against the wall. We just want to make it a piece of polycarbonate. This will take about 30 minutes top so it isn't a huge undertaking but it will make our robot so much faster at clearing corners. It is small things like this that make robots so much better.

3. Odometry pods.

Odometry pods are wheels that have no motor but do have a rotation sensor. They are used for making a team's auto so much more accurate. We saw a bunch of these at the Highlander Summit and these teams had like 6 disk autons so we really wanted to have a solo win point in regular competitions so we decided to add these pods.

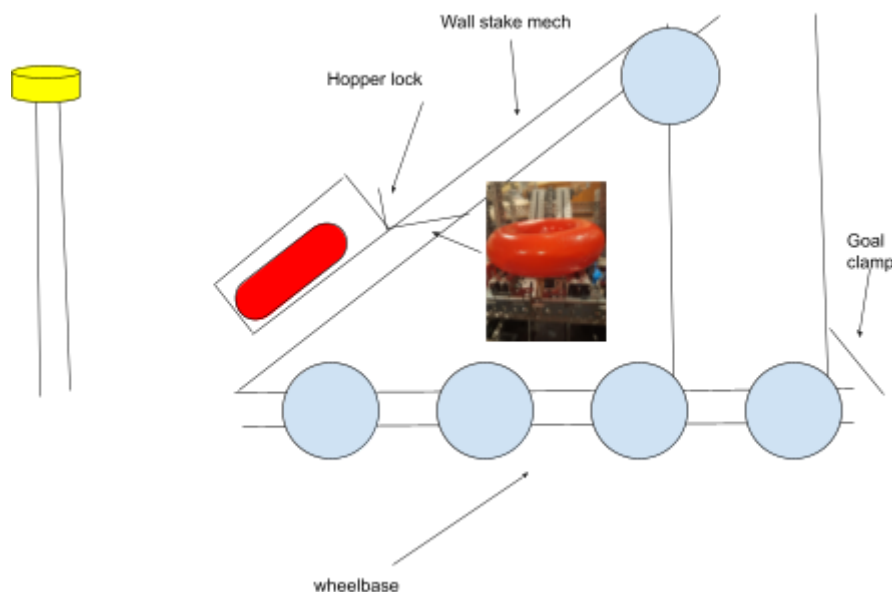


The problem with odometry pods is the complicated math that comes after the build. But when the math is done it is really easy to write autonomous quickly. If we can have a solo win point that is reliable and steady we can be really high in ranking.

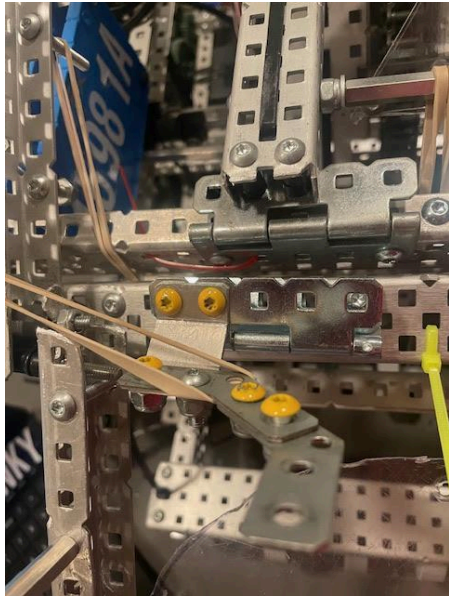
4. Wall stake scoring mech

The wall stakes in our opinion will play a huge part in this year's competition, each top ring is worth 3 points so in theory if you score you alliance and the two wall stakes that is an extra 9 points which is a deciding factor in many matches, pair that with a good auton and a tier one climb and you will be a force to be reckoned with.

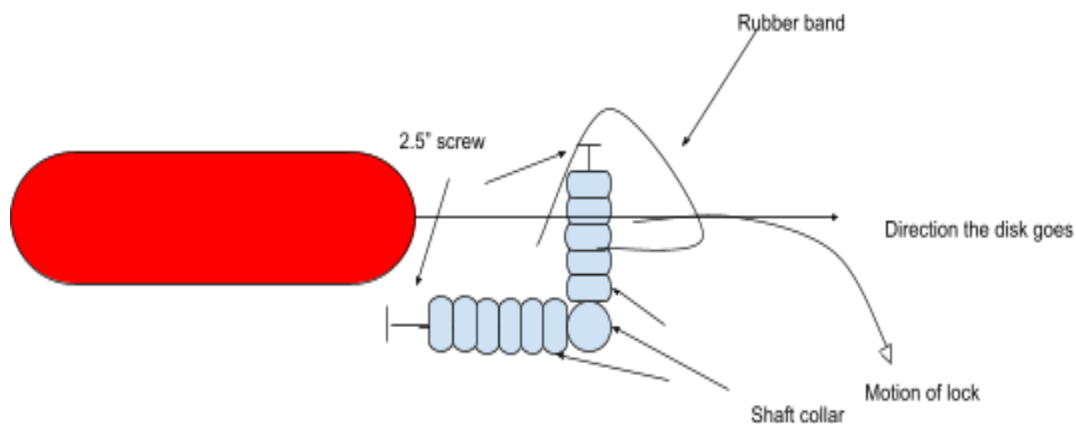
The wall stake mech is very easy to talk about doing but harder to actually do. The main problem is how to keep the disk in the hopper when the arms are up but also be able to load the hopper when the arms are down.



In the above image if you look at the hopper lock, the mechanism is shown below

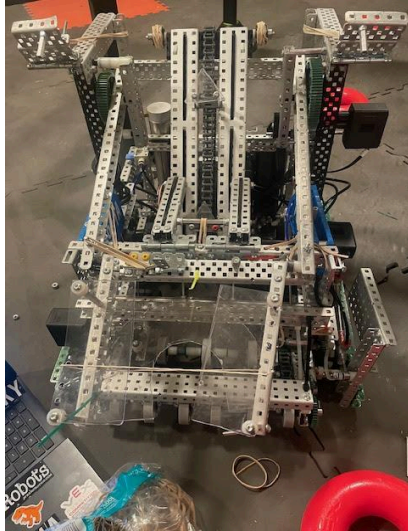


The way we designed this was interesting. In Vex you usually don't use collars to build but that was the only way that we could figure out how to make it rotate and come back with rubber bands. It is very janky and will probably be redone soon. This is another prototype that we have to try.



This is the other design we have yet to prototype. It will be in the next entry.

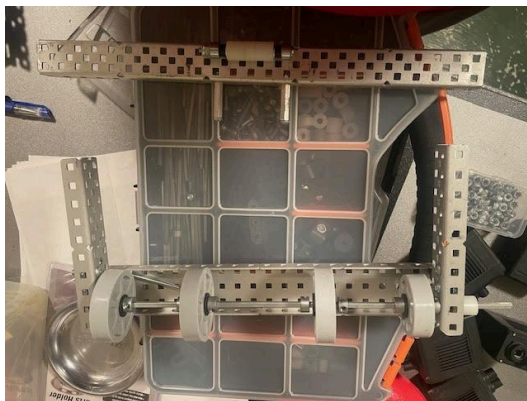
Overall the hopper is going very well and soon will be fully operational. The rush to make it work is so that the coding team can make the solo win point auton.



As you can see while it is not completely done, we are very far along on the journey to becoming a powerful team.

Copying robot: we are going to make another fully functional robot that will be our new competition robot. The reason that we would make another one is so that we can practice against each other because we don't have a sister team. This will make us much more formidable opponents to face.

This is the beginning of the new lower part of the robot intake, this will stay mostly the same, maybe a little streamlining. The main problem with it is that it takes a little time for the disk to catch in the intake. The way we will fix that is through trial and error.





This is the start of the wheelbase. Our wheelbase maker (Finley) wasn't there, so we didn't get much done. The new wheelbase will have the odometry pods and also a better goal clamp, the gear ratio will stay the same as it was before.

Making a schedule before our next competition: we have decided that it is very important for everyone on the team to have enough time to do what they need. The coding team needs to expand our auton and add auton skills. The build team is building a new robot. This means that we need to plan our time down to the hour. We also want 5-10 hours of practice for our drivers.

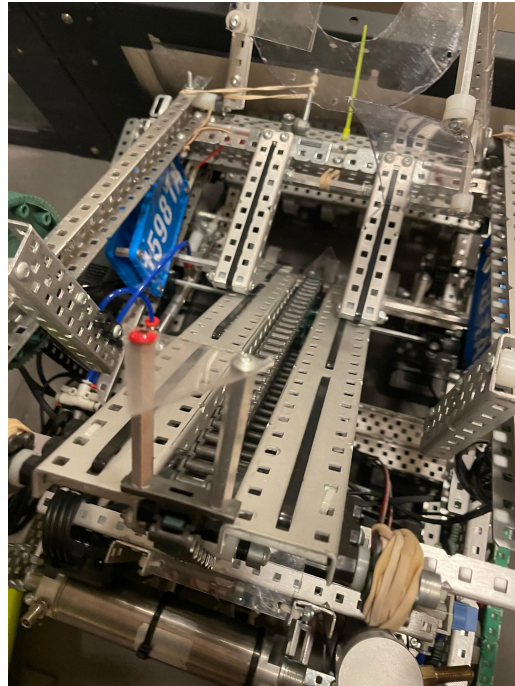
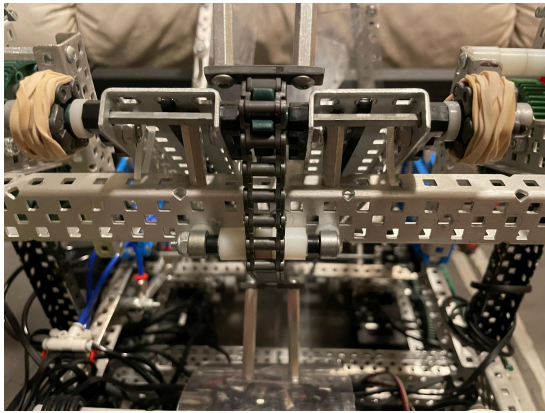
Hopper:

We were working on the hopper today. We managed to put the plexiglass bottom and top on.



We thought that would be the easiest way to keep the disk in the hopper. Today I (James) was informed that I will be doing CAD work on the robot as well as helping rebuild the robot so that the code team could work on it while we practiced driving. I started by rebuilding the wheelbase. This was a pretty big challenge because finley, the person who built the wheelbase was not here to help. I knew how it worked and how to put it together but it was hard for my first time building a wheelbase. I only ended up getting a little bit done especially because we had a short session and me and Andy spent way too long figuring out how to put the screw in the motor on the inside of the motor. We ended up having to take the metal inserts out and it was just barely big enough but with this design it was all worth it because if the screws were on the inside of the motors you could nylock the motors in this made it so they were practically impossible to get out via robot bashing; this has happened before motors have gotten loose and this has caused problems for our robots in the past. The last challenge we faced was not having enough wheels. This is an easily solved one. However, we just ordered some new wheels so next session we should be able to actually finish the wheelbase especially considering the original builder of it finley will be there.

At this session since Finley, the original builder of the wheelbase was back, (James) started rebuilding the intake. I started with a top piece meant to prevent the intake from jamming and allowing it to move more freely. After I was done with that I started on the main double bars of the intake. It was a challenge cutting the metal because it was my first time doing so although I ended up cutting it perfectly. The two bar part of the intake needed special cuts at the bottom so that the plexiglass thing could go through it. This part will connect to the rest of the intake later on although so far it has not connected.



Now that I (James) was done cutting metal we started constructing the main part of the intake. Putting in zip ties was the first step, this was to make sure the rings did not get slowed down by metal, a surface that provided greater friction. Next we put together the frame of the intake so that it could be attached right to the robot. Then we put on the gear at the top along with the rubber band mechanism that makes the rings flip right into the mobile goal. Lastly we put on the motor and the other gear. The last step is to put on the treads with the plexiglass stand-off grabbers; however, that will have to wait for next session.

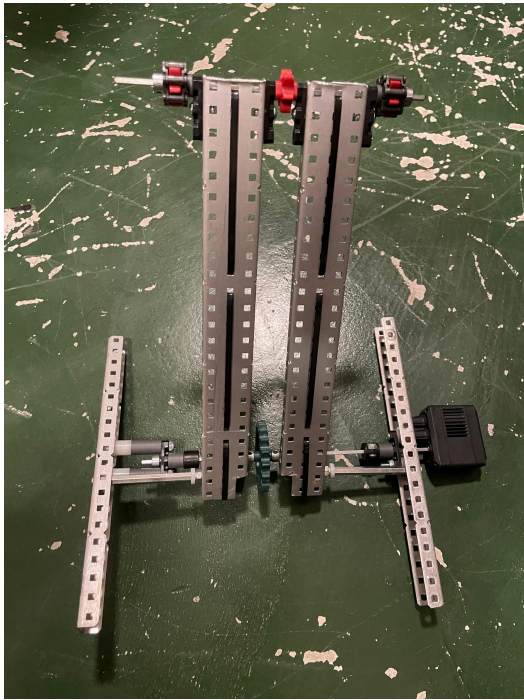
Accomplishments:

1. Made a calendar
2. We started to copy our robot
3. Have a design for the rest of the robot
4. Worked on the hopper

10/20/24:

Attendance:

1. Andy
2. Dan
3. James
4. Meelia
5. Bella
6. Sofia



Today we made some big decisions. First, we decided to sign up for a skirmish at Port Jervis and also because of that decision, we decided to stop rebuilding the robot because it would not be done in time and focus on other improvements to the already existing robot. We then made a list of priorities of things we wanted to get done before the skirmish. Number 1 on the list was improving the mobile goal clamp, secondly, we wanted to fix the pneumatics system because it was not fully connected and third of all we wanted to try and fix the hopper(wall stake mechanism). The build team

split up into 3 to work on these fixes for the robot and we got to work. Considerable progress was made on the mobile goal clamp, to fix it we messed with the pneumatics a bit and lowered it slightly, those small changes made it considerably better. For the hopper not much progress was made however, it needed to be completely redesigned, so the hopper team took it apart and started redesigning.

11/9/24(port jervis scrimmage):

Attendance:

1. Meelia
2. Dan
3. James
4. Sofia
5. Bella
6. Finley

Port Jervis High School Scrimmage - 11/9/2024

This was the first competition where our robot really got to shine. As it was a scrimmage, the scene was more low-key, and it gave us an excellent setting to test and develop our robot further. Our only competition was the Harvey school team and Mount Academy (MARS), and we put up a good fight. Halfway through the day, the Harvey team had to leave, while they were in first place. However, by the end of the day, we had pulled ahead of them as well as MARS, and took first place!

We also discovered something interesting during inspection... The inspectors were checking for loose pneumatic tubing coiled in the robot. This was to prevent teams from using the tubing as extra air storage, as by connecting it to just the end of a tank and placing a stopper on the other end, it was effectively increasing the volume of the tank. We had actually theorized doing this and had even planned how to place the tubing in the robot, somewhat jokingly. It's lucky we never went through with the joke, or we would have been disqualified.

This competition really showed us how much we had to emphasize match strategy. We were able to take down MARS, who had a similarly capable robot to ours, using good coordination with our teammate.

We also found some problems with our robot, including:

- Our intake would get stuck if the ring entered just as a hook was coming around its sprocket.
- Sometimes if a ring was intaked just as the robot reversed, it would fall out the front of the robot.
- Our rear clamp is very good at holding onto rings, but very hard to clamp onto them in the first place.
- Our hopper needed a redesign, or at least a rebuild, as it was too flimsy to work in its current state.
- We would benefit from wall runners on the sides of the wheelbase.

Match Strategy

A key part of success in VEX is match strategy. A good strategy that plays to the strengths of both teammates, as well as the weaknesses of the opponents, can turn what should be a losing match into a dominant win. For us to create some strategies, we first have to explore some strengths and weaknesses of our robot.

Strengths:

- Scoring rings on mobile goals
- Protecting goals in positive corner
- Pushing opponents to prevent them from scoring
- Easy tier 1 climb

Weaknesses:

- Picking up mobile goals
- Difficulty scoring wall stakes

Looking at these strengths and weaknesses, our most *comfortable* match strategy would be to fill up the mobile goal we collect during autonomous,

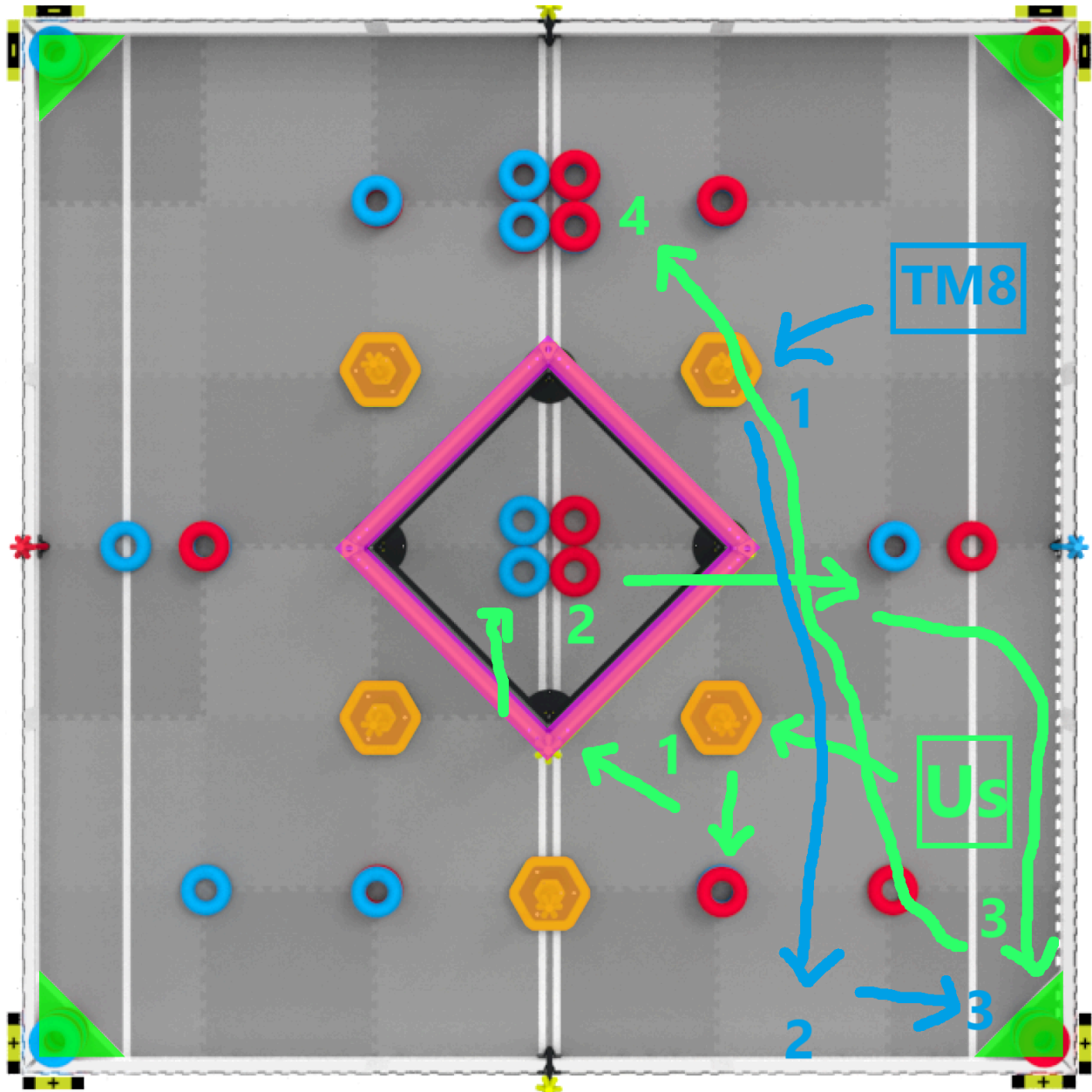
then hold the positive corner with the goal while our teammate collected more filled goals and possibly scored wall stakes. As such, **our ideal teammate would:**

- Be comfortable scoring on mobile goals
- Be able to score on wall stakes

By looking at these strengths and weaknesses, we have been able to create three basic match strategies that should be able to cover almost any match scenario, based on our teammate and our opponent's strengths.

Offensive:

In this scenario, our teammates may not be as comfortable scoring on mobile or wall stakes. As such, our robot would become the main scoring robot, driving around the field scoring rings on mobile goals while our teammate holds the corner and defends the wall stakes.



Movements for Us:

- 1) During the autonomous period, we collect the goal, pick up the ring, then touch the pole.
- 2) We then collect the 2 center blue rings, and then the blue ring near our alliance stake.
- 3) We sweep out the top 3 rings of the positive corner, leaving behind the bottom blue ring, which we intake, filling up our stake.

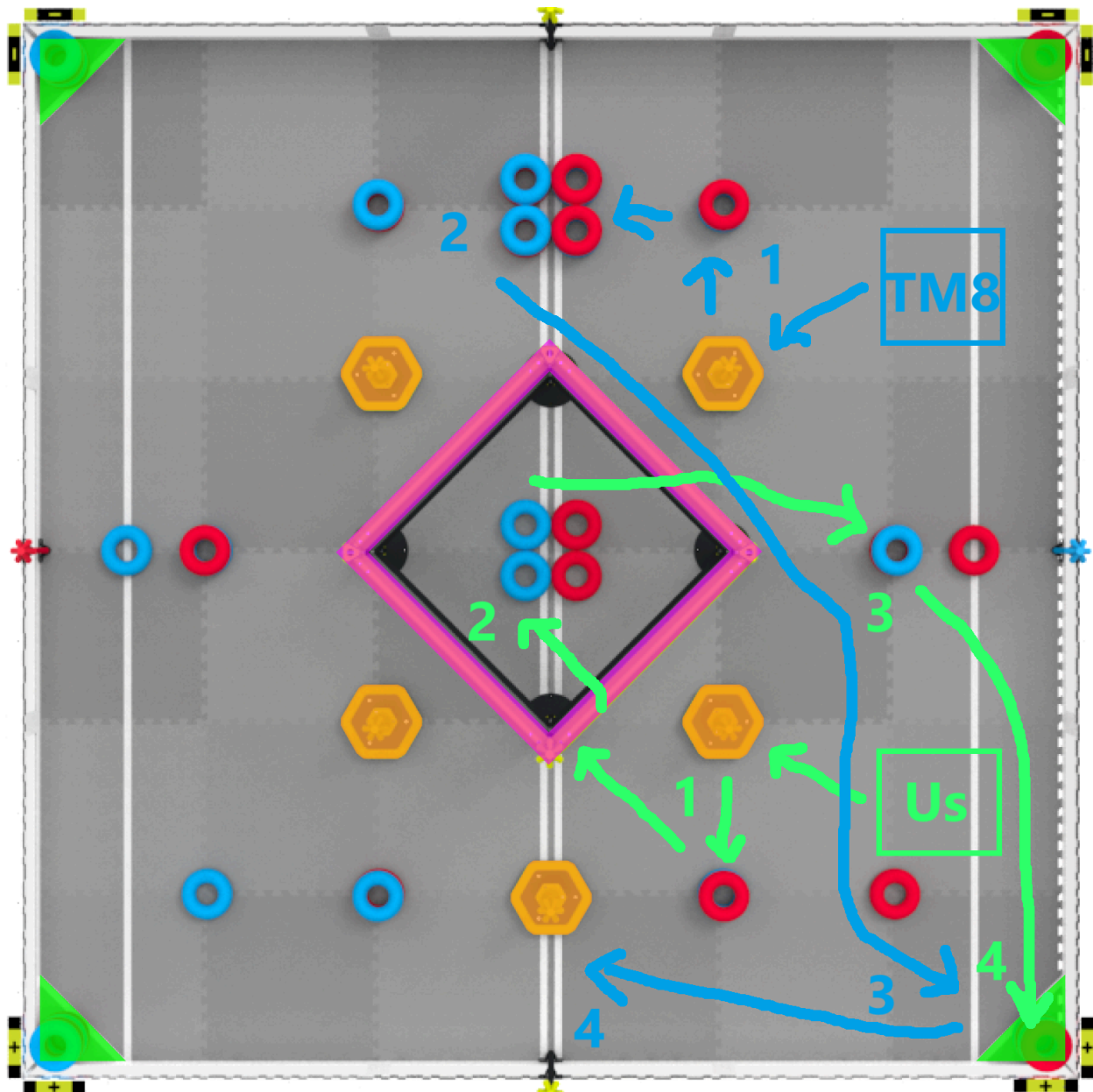
- 4) We then leave the stake for our teammate to defend, picking up their mobile goal and going towards the far wall stake to collect more rings.

Movements for Teammate (TM8):

- 1) Collect mobile goal.
- 2) Drive towards the positive corner, waiting for us to come clear it, and defending against the opponent while they wait.
- 3) Drop the empty mobile goal so we can pick it up, and defend the filled goal in the corner.

Defensive:

In this scenario, our teammate is confident in scoring on mobile goals, and probably can also put rings on wall stakes if necessary. We would then play a more passive role, filling up one mobile goal then immediately going to the positive corner. This eliminates our weakness with clamping onto a mobile goal, and allows us to use our superior size and pushing power to defend the corner.



Movements for Us:

- 1) During the autonomous period, we collect the goal, pick up the ring, then touch the pole.
- 2) We then collect the 2 center blue rings, and then the blue ring near our alliance stake.
- 3) (Optional) We also go collect the blue ring near our alliance stake, and maybe score it on the stake.

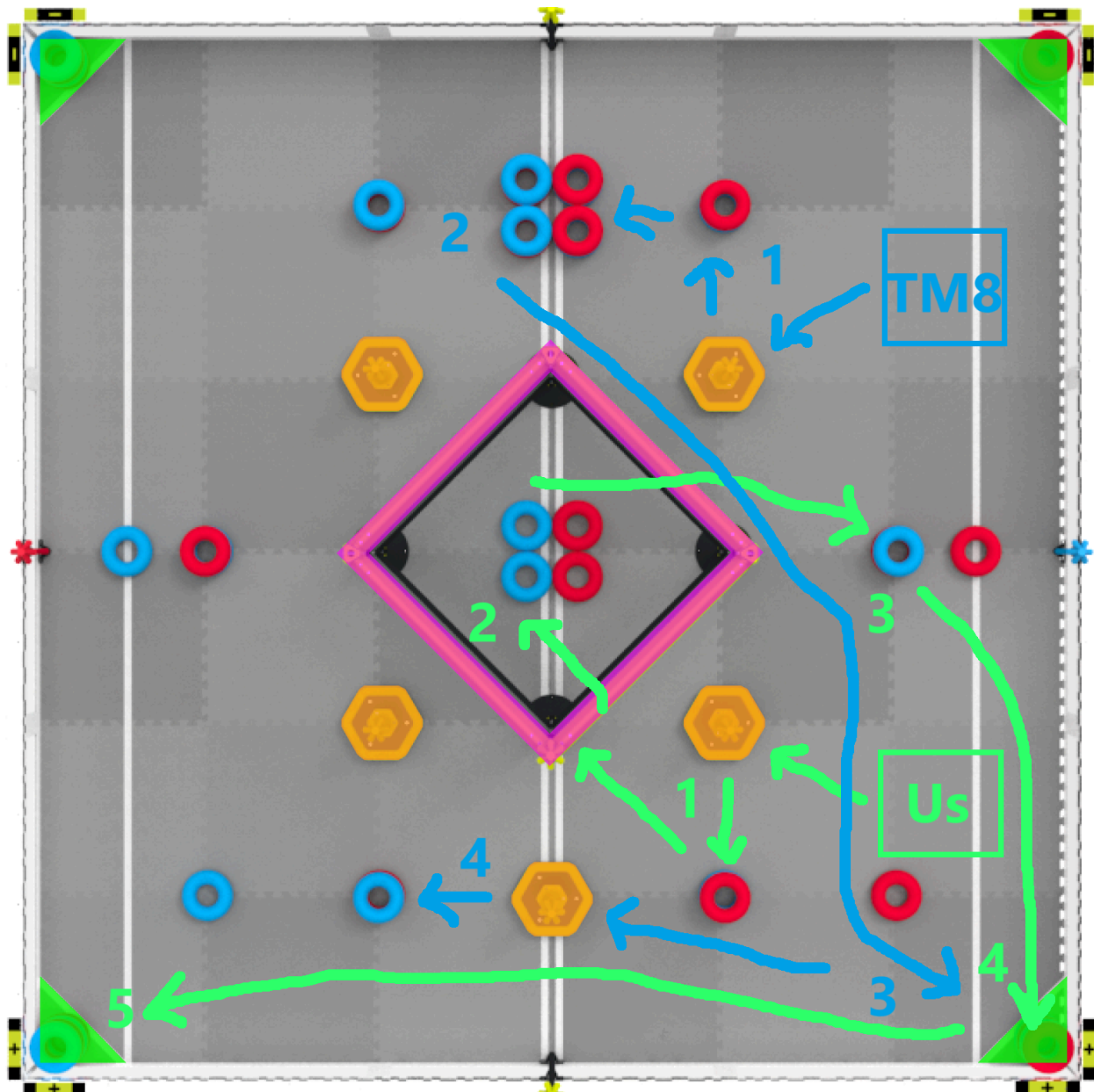
- 4) We sweep out the positive corner, and defend our 2 filled mobile goals while our teammate continues scoring on the third mobile goal or on wall stakes.

Movements for Teammate (TM8):

- 1) Collect mobile goal.
- 2) Fill the goal with the 6 nearby blue rings.
- 3) Drop the goal off at the positive corner, where we will defend it.
- 4) Continue scoring on the third mobile goal or on wall stakes, or play defense on opponents.

Hybrid:

In this scenario, both our robot and our teammate's robot have roughly the same capabilities. In this case, we can switch out tasks whenever we want, as both robots are equally qualified to complete them. This style might also involve a more risky playstyle, as we would have to be extra aggressive to counterbalance the disadvantage of being unable to cover each other's weaknesses. This might entail going for wall stakes, trying to steal both positive corners, and trying to fill the third mobile goal.



Movements for Us:

- 1) During the autonomous period, we collect the goal, pick up the ring, then touch the pole.
- 2) We then collect the 2 center blue rings, and then the blue ring near our alliance stake.
- 3) We also go collect the blue ring near our alliance stake, and score it on the stake.

- 4) We sweep out the positive corner, and place our filled mobile goal while our teammate continues scoring on the third mobile goal or on wall stakes.
- 5) We go and challenge the opponent's positive corner, trying to push them out of the corner using our superior size and torque, as well as possibly shoving rings under their mobile goal to lift it, and make it extremely awkward for the opponent to keep control of the corner.

Movements for Teammate (TM8):

- 1) Collect mobile goal.
- 2) Fill the goal with the 6 nearby blue rings.
- 3) Drop the goal off at the positive corner, where we will defend it.
- 4) Continue scoring on the third mobile goal or on wall stakes, while keeping our positive corner defended.

Strategy Conclusion:

This concludes our three main strategies for three general different scenarios. Obviously, we can change them slightly, varying based on our opponent's actions, our teammates capabilities, and the randomness of the match itself, although we expect many matches to play out in a similar way to the intended strategy. The ability to generalize strategy and define a set pattern creates consistency, and eases the load on the driver, which in turn translates to wins.

Credits: Field image:

<https://v5rc-kb.recf.org/hc/en-us/articles/23183747787543-Field-Overview>

11/16/24:

Attendance:

1. James
2. Finley
3. Dan
4. Meelia
5. Sofia
6. Bella

Today we talked about priorities after the amazing scrimmage. We figured out that the two main priorities were the auton and the hopper. After this we played some chess and had some hot cocoa in celebration of our first-place win.

12/7/24

Attendance:

1. James
2. Dan
3. Finley
4. James
5. Bella
6. Sofia
7. Andy

Today we mostly did code for the whole session, but the build team finally managed to get the hopper working nicely, we made the lock mech on the hopper much more detailed. All in all this was a good session because we made the hopper better.

This is the current code. Next week is the Mount Academy qualifier. The green in the code is comments explaining the workings of the code.

Code

```
#pragma region VEXcode Generated Robot Configuration
// Make sure all required headers are included.
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>
#include <math.h>
#include <string.h>

#include "vex.h"

using namespace vex;

// Brain should be defined by default
brain Brain;

// START V5 MACROS
#define waitUntil(condition) \
do { \
    wait(5, msec); \
} while (!(condition))

#define repeat(iterations) \
for (int iterator = 0; iterator < iterations; iterator++)

// END V5 MACROS

// Robot configuration code.
controller Controller1 = controller(primary);
motor Backleft = motor(PORT1, ratio18_1, true);

motor Backright = motor(PORT2, ratio18_1, false);

motor Middleleft = motor(PORT3, ratio18_1, true);

motor Middleright = motor(PORT4, ratio18_1, false);
```



```

motor Frontleft = motor(PORT5, ratio18_1, true);

motor Frontright = motor(PORT6, ratio18_1, false);

motor Intaketop = motor(PORT7, ratio18_1, false);

motor Intakebottom = motor(PORT8, ratio18_1, true);

digital_out BackClamp = digital_out(Brain.ThreeWirePort.A);
digital_out Hopper = digital_out(Brain.ThreeWirePort.B);
motor Liftmotor = motor(PORT9, ratio18_1, false);

digital_out HopperReload = digital_out(Brain.ThreeWirePort.C);
controller Controller2 = controller(partner);
digital_out Doinker_Lift = digital_out(Brain.ThreeWirePort.D);

// generating and setting random seed
void initializeRandomSeed(){
    int systemTime = Brain.Timer.systemHighResolution();
    double batteryCurrent = Brain.Battery.current();
    double batteryVoltage = Brain.Battery.voltage(voltageUnits::mV);

    // Combine these values into a single integer
    int seed = int(batteryVoltage + batteryCurrent * 100) + systemTime;

    // Set the seed
    srand(seed);
}

void vexcodeInit() {

    //Initializing random seed.
    initializeRandomSeed();
}

```

```
// Helper to make playing sounds from the V5 in VEXcode easier and
// keeps the code cleaner by making it clear what is happening.
```

```
void playVexcodeSound(const char *soundName) {
    printf("VEXPlaySound:%s\n", soundName);
    wait(5, msec);
}
```

```
// define variable for remote controller enable/disable
```

```
bool RemoteControlCodeEnabled = true;
```

```
#pragma endregion VEXcode Generated Robot Configuration
```

```
/*-----*/
/*
/*
/* Module:    main.cpp
/* Author:    {author}
/* Created:   {date}
/* Description: V5 project
/*
/*-----*/
```

```
motor_group mgL(Frontleft, Middleleft, Backleft);
motor_group mgR(Frontright, Middleright, Backright);
drivetrain DT(mgL, mgR);
```

```
bool clamp = false;
bool lift = false;
bool ToggleHop = false;
bool Hop = false;
bool ReHop = false;
float speed_mod = 1.0;
```

```
// Include the V5 Library
```

```
#include "vex.h"
```

```
#include "math.h"
```

```
// Allows for easier use of the VEX Library
```

```
using namespace vex;
```

Coach _____ Team member: _____ Pg

competition Competition;

void Autonomous()

```
{
    //I will refer to the field as if it were a coordinate plane like once or twice
    //the x wait timers after each stop is to allow the robot to settle, increase this if needed
    double x = 0.1; //<-- this is in seconds
    //13.25=360 degrees 27.169 degrees= 1 inch
    //this first forward movement is to get the robot a bit away from the wall
    Intaketop.setVelocity(100, percent);
    Intakebottom.setVelocity(100, percent);
    Hopper.set(false); //hopper and intake lift are together
    HopperReload.set(true);

    //-----
    Backleft.spinFor(reverse, 679.245, degrees,false);//telling the back left to spin in reverse 679.245% the false is so it
    goes on to the next line while reading this line
    Backright.spinFor(reverse, 679.245, degrees,false);//telling the back right to spin in reverse 679.245% the false is so
    it goes on to the next line while reading this line
    Middleleft.spinFor(reverse, 679.245, degrees,false);//telling the middle left to spin in reverse 679.245% the false is so
    it goes on to the next line while reading this line
    Middleright.spinFor(reverse, 679.245, degrees,false);//telling the middle right to spin in reverse 679.245% the false is
    so it goes on to the next line while reading this line
    Frontleft.spinFor(reverse, 679.245, degrees,false);//telling the front left to spin in reverse 679.245% the false is so it
    goes on to the next line while reading this line
    Frontright.spinFor(reverse, 679.245, degrees);//telling the front right to spin in reverse 679.245%
    //-----
    wait(.05, seconds);//telling the robot to wait .05 of a sceond until going on to the rest of the code
    BackClamp.set(true);//telling the clamp to go down
    wait(.1, seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
    Backleft.stop(coast);//stoping the power to the back left motor
    Backright.stop(coast);//stoping the power to the back right motor
    Middleleft.stop(coast);//stoping the power to the middle left motor
    Middleright.stop(coast);//stoping the power to the middle right motor
    Frontleft.stop(coast);//stoping the power to the front left motor
    Frontright.stop(coast);//stoping the power to the front right motor
    wait(x, seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
    //----
    //Preload in the intake comment out if using the preload in the hopper
    wait(1,seconds);//telling the robot to wait 1 sceond until going on to the rest of the code
}
```

Coach _____ Team member: _____ Pg

```

Intakebottom.spin(forward);//telling the intake bottom to spin forward
Intaketop.spin(forward);//telling the intake top to spin forward
wait(1, seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
Intaketop.stop(coast);//telling the intake top to stop spinning
Intakebottom.stop(coast);//telling the intake bottom to stop spinning
//----

Backleft.spinFor(reverse,250, degrees,false);//telling the back left motor to spin reverse 250% the false is so it goes
on to the next line while reading this line
Backright.spinFor(forward, 250, degrees,false);//telling the back right motor to spin forward 250% the false is so it
goes on to the next line while reading this line
Middleleft.spinFor(reverse, 250, degrees,false);//telling the middle left motor to spin reverse 250% the false is so it
goes on to the next line while reading this line
Middleright.spinFor(forward, 250, degrees,false);//telling the middle left motor to spin forward 250% the false is so it
goes on to the next line while reading this line
Frontleft.spinFor(reverse, 250, degrees,false);//telling the front left motor to spin reverse 250% the false is so it goes
on to the next line while reading this line
Frontright.spinFor(forward, 250, degrees);//telling the front right motor to spin forward 250%
wait(.1,seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
Backleft.stop(coast);//stoping the power to the back left motor
Backright.stop(coast);//stoping the power to the back right motor
Middleleft.stop(coast);//stoping the power to the middle left motor
Middleright.stop(coast);//stoping the power to the middle right motor
Frontleft.stop(coast);//stoping the power to the front left motor
Frontright.stop(coast);//stoping the power to the front right motor
wait(.1,seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
Backleft.setVelocity(70, percent);//setting the back left motor vlocity to 70%
Backright.setVelocity(70, percent);//setting the back right motor vlocity to 70%
Middleleft.setVelocity(70, percent);//setting the middle left motor vlocity to 70%
Middleright.setVelocity(70, percent);//setting the middle right mottor vlocity to 70%
Frontleft.setVelocity(70, percent);//setting the front left mottor vlocity to 70%
Frontright.setVelocity(70, percent);//setting the front right mottor vlocity to 70%
wait(.01,seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
Intakebottom.spin(forward);//spining the intake bottom foward
Intaketop.spin(forward);//spinning the intake top forward
Backleft.spinFor(forward, 452.056, degrees,false);//telling the back left motor to spin forward 452.056% the false is
so it goes on to the next line while reading this line
Backright.spinFor(forward, 452.056, degrees,false);//telling the back right motor to spin forward 452.056% the false
is so it goes on to the next line while reading this line
Middleleft.spinFor(forward, 452.056, degrees,false);//telling the middle left motor to spin forward 452.056% the false
is so it goes on to the next line while reading this line
Middleright.spinFor(forward, 452.056, degrees,false);//telling the middle right motor to spin forward 452.056% the
false is so it goes on to the next line while reading this line

```

```

Frontleft.spinFor(forward, 452.056, degrees,false);//telling the front left motor to spin forward 452.056% the false is
so it goes on to the next line while reading this line
Frontright.spinFor(forward, 452.056, degrees);//telling the fornt right motor to spin forward 452.056%
wait(3.5,seconds);//telling the robot to wait 3.5 sceonds until going on to the rest of the code
Intaketop.stop(coast);//telling the intake top to stop spinning
Intakebottom.stop(coast);//telling the intake bottom to stop spinning
wait(.01,seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
//-----
Backleft.spinFor(reverse, 130, degrees,false);//telling the back left motor to spin reverse 130% the false is so it goes
on to the next line while reading this line
Backright.spinFor(reverse, 130, degrees,false);//telling the back right motor to spin reverse 130% the false is so it
goes on to the next line while reading this line
Middleleft.spinFor(reverse, 130, degrees,false);//telling the middle left motor to spin reverse 130% the false is so it
goes on to the next line while reading this line
Middleright.spinFor(reverse, 130, degrees,false);//telling the middle right motor to spin reverse 130% the false is so it
goes on to the next line while reading this line
Frontleft.spinFor(reverse, 130, degrees,false);//telling the front left motor to spin reverse 130% the false is so it goes
on to the next line while reading this line
Frontright.spinFor(reverse, 130, degrees);//telling the front right motor to spin reverse 130%
//----- STARTS THE SOLO WP CODE *can be commented out if needed*
/*
Backleft.setVelocity(50, percent);//setting the back left motor vlocity to 50%
Backright.setVelocity(50, percent);//setting the back right motor vlocity to 50%
Middleleft.setVelocity(50, percent);//setting the middle left motor vlocity to 50%
Middleright.setVelocity(50, percent);//setting the middle right motor vlocity to 50%
Frontleft.setVelocity(50, percent);//setting the front left motor vlocity to 50%
Frontright.setVelocity(50, percent);//setting the front right motor vlocity to 50%
//-----
Backleft.spinFor(forward, 550, degrees,false);//telling the back left motor to spin forward 550% the false is so it goes
on to the next line while reading this line
Backright.spinFor(reverse, 550, degrees,false);//telling the back left motor to spin reverse 550% the false is so it
goes on to the next line while reading this line
Middleleft.spinFor(forward, 550, degrees,false);//telling the middle left motor to spin forward 550% the false is so it
goes on to the next line while reading this line
Middleright.spinFor(reverse, 550, degrees,false);//telling the middle right motor to spin reverse 550% the false is so it
goes on to the next line while reading this line
Frontleft.spinFor(forward, 550, degrees,false);//telling the front left motor to spin reverse 550% the false is so it goes
on to the next line while reading this line
Frontright.spinFor(reverse, 550, degrees);//telling the front right motor to spin reverse 550%
wait(.01,seconds);//telling the robot to wait .1 of a sceond until going on to the rest of the code
//----
//-----
//--

```



```

Hopper.set(true);
Liftmotor.spinToPosition( -525, degrees);
Intakebottom.spin(forward);
Intaketop.spin(forward);
//--
Backleft.spinFor(forward, 750, degrees,false);
Backright.spinFor(forward, 750, degrees,false);
Middleleft.spinFor(forward, 750, degrees,false);
Middleright.spinFor(forward, 750, degrees,false);
Frontleft.spinFor(forward, 750, degrees,false);
Frontright.spinFor(forward, 750, degrees);
//--
Hopper.set(false);
Backleft.spinFor(forward, 100, degrees,false);
Backright.spinFor(forward, 100, degrees,false);
Middleleft.spinFor(forward, 100, degrees,false);
Middleright.spinFor(forward, 100, degrees,false);
Frontleft.spinFor(forward, 100, degrees,false);
Frontright.spinFor(forward, 100, degrees);
//--
Hopper.set(true);
/--
/--
Backleft.spinFor(forward, 300, degrees,false);
Backright.spinFor(forward, 300, degrees,false);
Middleleft.spinFor(forward, 300, degrees,false);
Middleright.spinFor(forward, 300, degrees,false);
Frontleft.spinFor(forward, 300, degrees,false);
Frontright.spinFor(forward, 300, degrees);
/--
wait(2.5,seconds);
Intaketop.stop(coast);
Intakebottom.stop(coast);
wait(.5,seconds);
/--

Liftmotor.spinToPosition( -100, degrees);
Backleft.spinFor(reverse, 700, degrees,false);
Backright.spinFor(reverse, 700, degrees,false);

```

```

Middleleft.spinFor(reverse, 700, degrees,false);
Middleright.spinFor(reverse, 700, degrees,false);
Frontleft.spinFor(reverse, 700, degrees,false);
Frontright.spinFor(reverse, 700, degrees);
//---
Backleft.spinFor(forward, 200, degrees,false);
Backright.spinFor(forward, 200, degrees,false);
Middleleft.spinFor(forward, 200, degrees,false);
Middleright.spinFor(forward, 200, degrees,false);
Frontleft.spinFor(forward, 200, degrees,false);
Frontright.spinFor(forward, 200, degrees);
//--
Intaketop.stop();
Intakebottom.stop();
*/
//If commented out stop here

/* Finley said we might want to add a bit that while the intake is spinning to get the blue top red bottom stack we might want to make the robot drive back wards so it does not pick up the red disk*/
}

```

```

//67.883----135-----1844.313----1304.112

```

```

void UserControl(){
while(true){
Intaketop.setVelocity(100, percent);
Intakebottom.setVelocity(100, percent);
Liftmotor.setVelocity(100, percent);
BackClamp.set(false);
Hopper.set(false);
while (true) {
    mgL.setVelocity(Controller1.Axis3.position() * speed_mod, percent);
    mgR.setVelocity(Controller1.Axis2.position() * speed_mod, percent);
    mgL.spin(forward);
    mgR.spin(forward);
    wait(5, msec);
}
}

```

Coach _____ Team member: _____ Pg

```

}
}
// Button L1, toggles clamp
void onevent_Controller1ButtonL1_pressed_0() {
    clamp = !clamp;
    BackClamp.set(clamp);
}

// Button B, toggles lift pneumatics and motor
void onevent_Controller1ButtonB_pressed_0() {
    Hopper.set(true);
    ToggleHop = !ToggleHop;
    if (ToggleHop == false) {
        Liftmotor.spinToPosition(-100, degrees); //for going down
    }
    else {
        Liftmotor.spinToPosition(-525, degrees); //for going up
    }
}

// Button Right, Close and open Hopper
void onevent_Controller1ButtonRight_pressed_0() {
    Hop = !Hop;
    if (Hop == false) {
        Hopper.set(true);
    }
    else {
        Hopper.set(false);
    }
}

// Button Y, toggles Doinker and intake Lift
void onevent_Controller1ButtonY_pressed_0() {
    lift = !lift;
    if (lift == false) {
        Doinker_Lift.set(true);
    }
    else {
        Doinker_Lift.set(false);
    }
}

```

```
}  
}
```

```
// Button Down, toggles Hopper reload
```

```
void onevent_Controller1ButtonDown_pressed_0() {  
    ReHop = !ReHop;  
    if (ReHop == false) {  
        HopperReload.set(true);  
    }  
    else {  
        HopperReload.set(false);  
    }  
}
```

```
// Button R2, spins intake backwards, if lift is down then lower it a bit
```

```
void onevent_Controller1ButtonR2_pressed_0() {  
    Intakebottom.spin(reverse);  
    Intaketop.spin(reverse);  
    if (lift == false) {  
        Liftmotor.spinToPosition(-50, degrees);  
    }  
}
```

```
// Button R1, spins intake fowards, if lift is down set to correct position
```

```
void onevent_Controller1ButtonR1_pressed_0() {  
    Intakebottom.spin(forward);  
    Intaketop.spin(forward);  
    if (lift == false) {  
        Liftmotor.spinToPosition(-150, degrees);  
    }  
}
```

```
// Release Button R1, stops intake
```

```
void onevent_Controller1ButtonR1_released_0() {  
    Intakebottom.stop();  
    Intaketop.stop();  
}
```

```

}

// Release Button R2, stops intake
void onevent_Controller1ButtonR2_released_0() {
    Intakebottom.stop();
    Intaketop.stop();
}

// Button L2, modifies bot's speed to %20
void onevent_Controller1ButtonL2_pressed_0() {
    speed_mod = 0.2;
}

// Release Button L2, returns bot's speed to %100
void onevent_Controller1ButtonL2_released_0() {
    speed_mod = 1;
}

int main() {
    // Initializing Robot Configuration. DO NOT REMOVE!
    vexcodeInit();
    Competition.drivercontrol(UserControl);
    Competition.autonomous(Autonomous);

    Controller1.ButtonDown.pressed(onevent_Controller1ButtonDown_pressed_0);
    Controller1.ButtonB.pressed(onevent_Controller1ButtonB_pressed_0);
    Controller1.ButtonL1.pressed(onevent_Controller1ButtonL1_pressed_0);
    Controller1.ButtonR1.pressed(onevent_Controller1ButtonR1_pressed_0);
    Controller1.ButtonR2.pressed(onevent_Controller1ButtonR2_pressed_0);
    Controller1.ButtonR1.released(onevent_Controller1ButtonR1_released_0);
    Controller1.ButtonR2.released(onevent_Controller1ButtonR2_released_0);
    Controller1.ButtonL2.pressed(onevent_Controller1ButtonL2_pressed_0);
    Controller1.ButtonL2.released(onevent_Controller1ButtonL2_released_0);
    Controller1.ButtonLeft.pressed(onevent_Controller1ButtonRight_pressed_0);
    Controller1.ButtonY.pressed(onevent_Controller1ButtonY_pressed_0);

    wait(15, msec);
    // post event registration

```

```
// set default print color to black
printf("\033[30m");

// wait for rotation sensor to fully initialize
wait(30, msec);
}
```


12/14/24(Mount Academy qualifier):

Attendance:

1. Andy
2. Finley
3. James
4. Bella
5. Dan
6. Meelia
7. Sofia

Today was the Mount Academy qualifier. We arrived at the event at 7:30am. It was held in a very crowded gym there was 40 teams and we got ourselves settled. We then got to work testing the hopper we tested it around 10 times and here are the results.

Hopper tests				
# of test		driver		⌵ Status
1		Andy		succe... ⌵
2		Andy		fail ⌵
3		James		succe... ⌵
4		Finley		succe... ⌵
5		James		fail ⌵
6		Finley		fail ⌵
7		Andy		fail ⌵
8		Andy		fail ⌵
9		James		fail ⌵
10		Finley		fail ⌵

Coach _____ Team member: _____ Pg

As you can see in the above table we started off very well and then descended into the final 6 failing. Our theory as to why that happened is as follows. We removed a part that made the robot out of size, this then interfered in the hoppers lock mechanism, which allowed the ring to slip out of the hopper.

We then started off into the qualification matches.

See below for results.

Qualifier #6	Dec 14th at 10:29 AM	10504A	15981A	26	78792T	19383B	28
Qualifier #18	Dec 14th at 11:46 AM	6277F	15981A	28	2502X	32563D	15
Qualifier #23	Dec 14th at 12:07 PM	78792E	10504C	23	15981A	19383E	7
Qualifier #30	Dec 14th at 12:47 PM	32563C	70407R	40	10504D	15981A	11
Qualifier #45	Dec 14th at 1:50 PM	18693B	2622T	9	15981A	97140B	30
R16 #7-1	Dec 14th at 3:33 PM	88188A	2502S	33	15981A	78792K	16

Rank 25

WP / AP / SP 4 / 18 / 68

Match 1. In this match we were evenly balanced in skill with the opposing alliance. In the end it came down to a wrong color ring, and more importantly a missed hang from our alliance, this put us in a bad position off the bat.

Coach _____ Team member: _____ Pg

Match 2. We were heavily ahead in this match and as expected we won with relative ease. This also showed that holding two positive corners in our level of competition pretty much means a win.

Match 3. This match we suffered some technical difficulty. It was pretty evenly matched but our alliance was really bad and the opposing alliance managed to break the chain on our intake so we couldn't score.

Match 4. We were against the best team in our division and we stood no chance.

Match 5. This was pretty heavy in our favor. We were paired with a good team against two mediocre teams. We controlled both positive corners the whole match.

Match 6. This was round of 16 we were the 14th seed so we were facing the 3rd seed, and as such we got destroyed, our alliance couldn't move at all and we ended on a bad note.

In the end we thought that this was a pretty good event, what we really want to add is a Lady brown wall stake mech instead of the the hopper. And color sorting so that we don't make a similar mistake to match 1.

Mount academy tournament entry

Today we went to the mount academy tournament, it was a great experience. When we walked in we had a short team meeting about anything we wanted to do before we started. We eventually decided that we wanted to get the wall stake mechanism to work as it had stopped working the day before the tournament for an unknown reason. The problem was that the ring kept getting flipped out whenever we tried to intake it, so we added some bars on top of where the ring was going to go and problem solved, but actually problem not solved because it interfered with the intake, so we had to revise this and bend the bars until it didn't interfere with the intake but also stopped the rings for being launched. After we did this we wanted to practice but first we had to go to inspection. Inspection

went well and we got to the practice fields. It was mainly Andy practicing scoring wall stakes as we decided it would be better if one person was fluent in it and when there was going to be a challenging match we could have said person play that match rather than wasting time and having all drivers be mediocre at scoring wall stakes. After Andy felt like he was doing good, we realized there was a slight problem with the autonomous code, the code team got to work right away and while they weren't using the robot I managed to get some practice in because Andy said I might be driving for a match or two. After a while matches started up and we were pretty ready to go.

Qual #6	78792T 19383B	28 - 26	10504A 15981A
Qual #18	2502X 32563D	15 - 28	6277F 15981A
Qual #23	15981A 19383E	7 - 23	78792E 10504C
Qual #30	10504D 15981A	11 - 40	32563C 70407R
Qual #45	15981A 97140B	30 - 9	18693B 2622T
R16 #7-1	15981A 78792K	16 - 33	88188A 2502S

Qualifier 6 was a close game and it was debated for a while whether we had won or not, but we came out two points short of a draw. The next game lifted our spirits though as it was an overwhelming victory in the next two matches we were playing against very good teams so they didn't end well for us but the last qualifier probably ended up getting us into the eliminations, we played very well and won by 21 points. In the first eliminations round the match started out very even but then the other team ended up gaining control of the positive corner and they had an extra goal so they came out on top

12/21/24:

Attendance:

1. Andy
2. Sofia
3. Bella
4. Eben
5. James
6. Finley

Today we had a team holiday party. We didn't end up accomplishing anything but that was fine because it was a good team bonding event.

Here are some pictures from the party.
(insert pictures of party)

We also decided that we need to rebuild the robot in order to perform better at the next competition. This is the results of the vote.

Yes

Andy

Finley

James

Sofia

No

Bella

Dan

No opinion

Eben

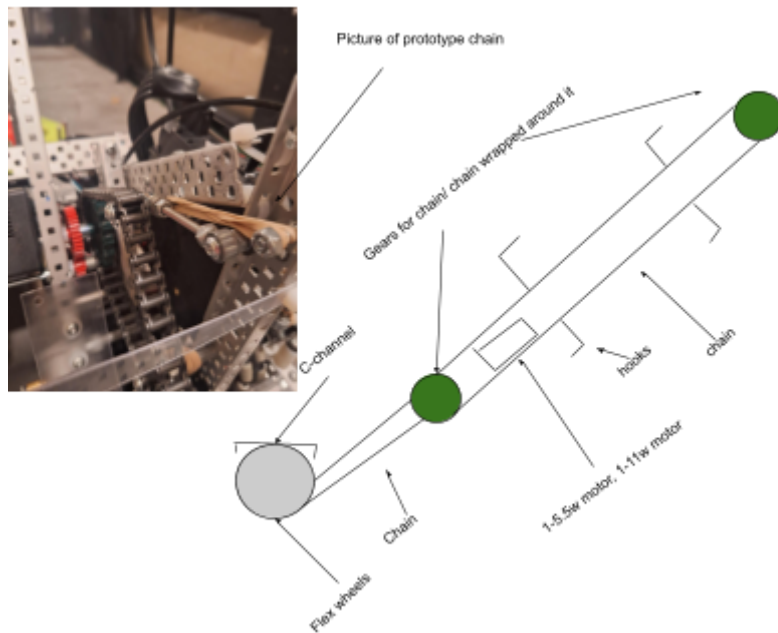
As you can see it wasn't unanimous but it passed, we then agreed to meet again on 12/26 to start building said new robot.

12/26/24:

Attendance:

1. Andy
2. Finley

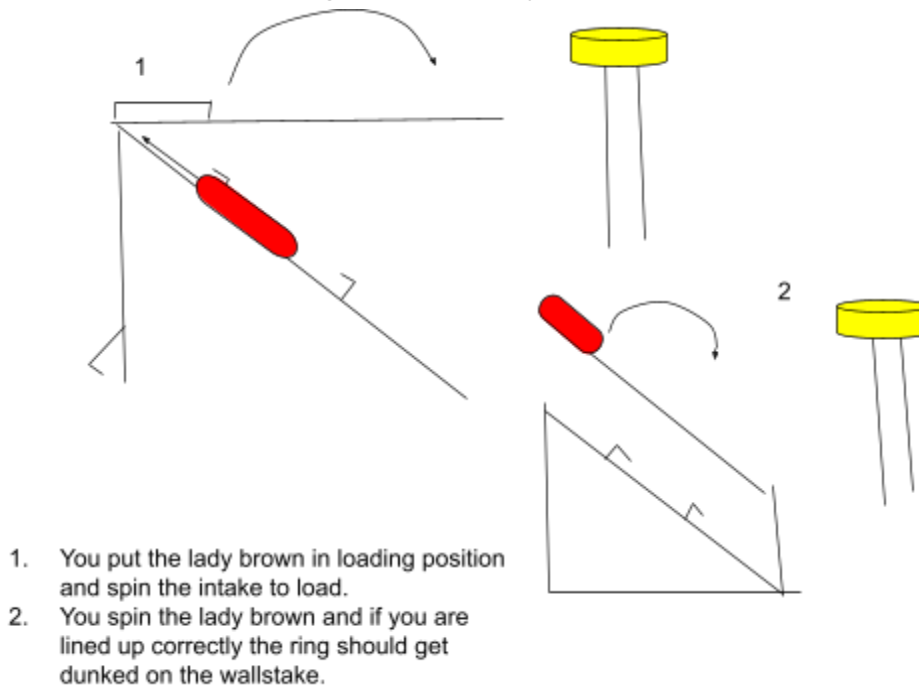
Today we started a two day camp to make a new robot, the outline of the robot is as follows. The wheelbase is pretty much the same as the old robot, 17" by 17" square that uses 200rpm cartridges and is geared for speed, we are going to stick with a hook intake but have the whole intake chained together in order to make it more efficient see below for a visual on that.



We are going to switch from the hopper design for scoring on wall stakes to a lady brown.

Coach _____ Team member: _____ Pg

See below for a design of the lady brown.



We are going with a two piston goal clamp so we have more power over the goal. We thought that this was important because of the amount of head to head clashing.

12/27/24:

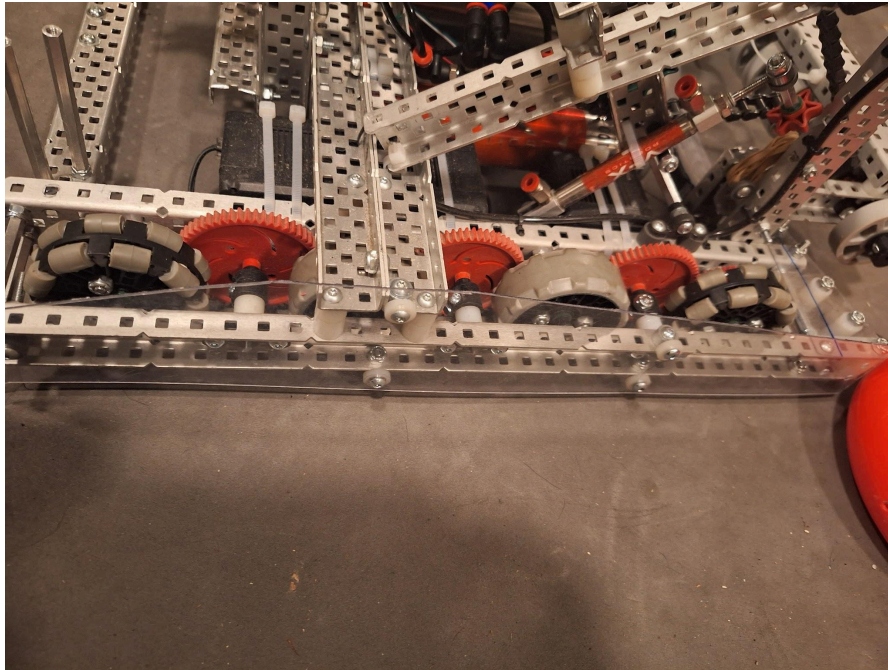
Foundation and Initial Design

Attendance:

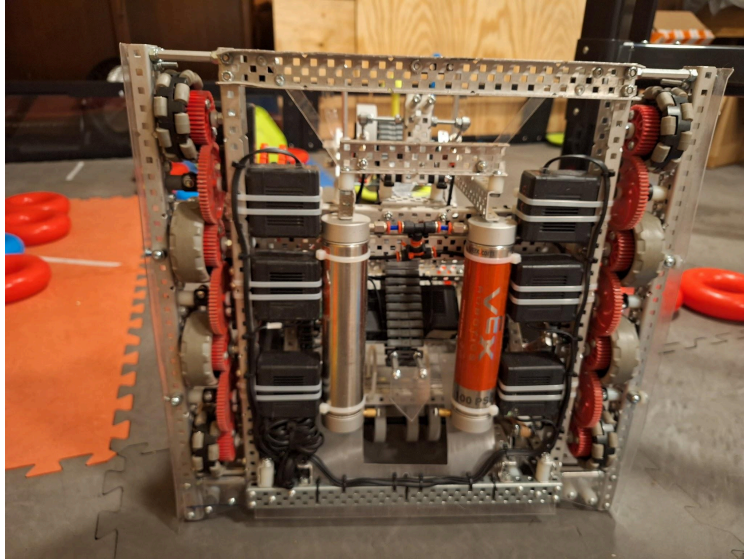
1. Andy
2. Finley
3. Dan

Coach _____ Team member: _____ Pg

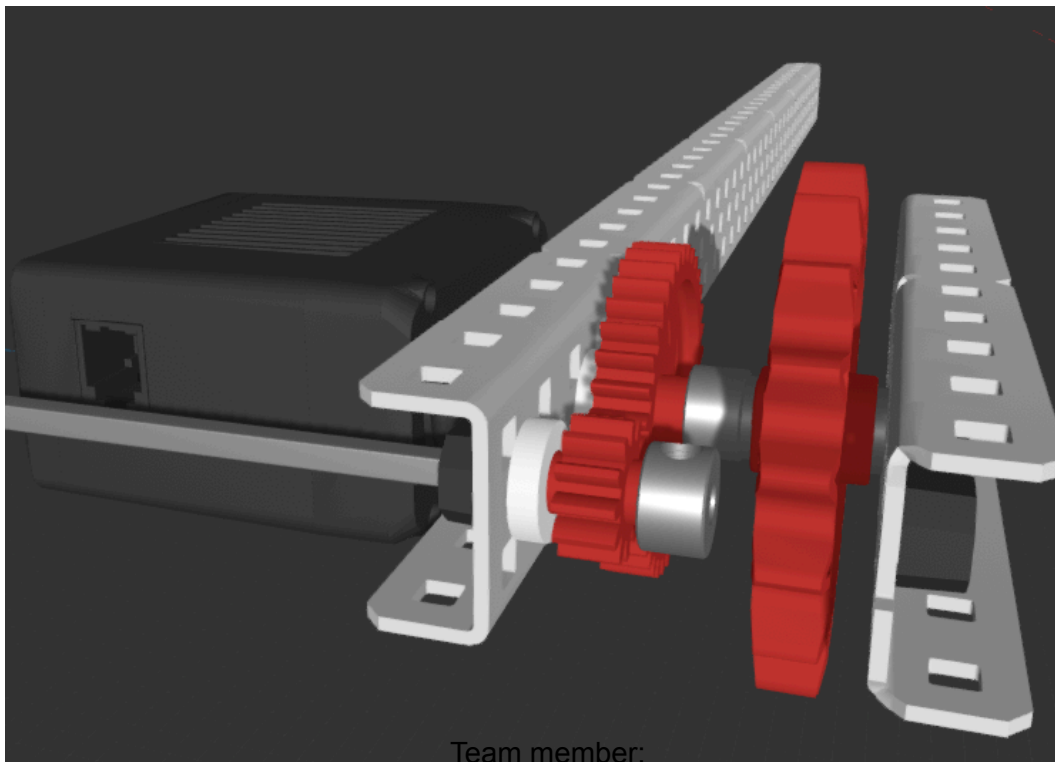
The first day focused on building a solid foundation for the robot. We began by constructing the wheelbase, which followed the design of the original model. It operates at a speed of 333 RPM, achieved using 200 RPM motors geared at a 60:36 ratio. To improve stability and reduce unwanted sliding, we incorporated two center traction wheels that provide grip and prevent lateral movement.



Wire management was another key task. By neatly organizing and securing wires, we ensured operational consistency, reduced the risk of wires getting caught in gears, and gave the robot a polished, professional appearance. A clean wiring setup also makes future troubleshooting much easier.



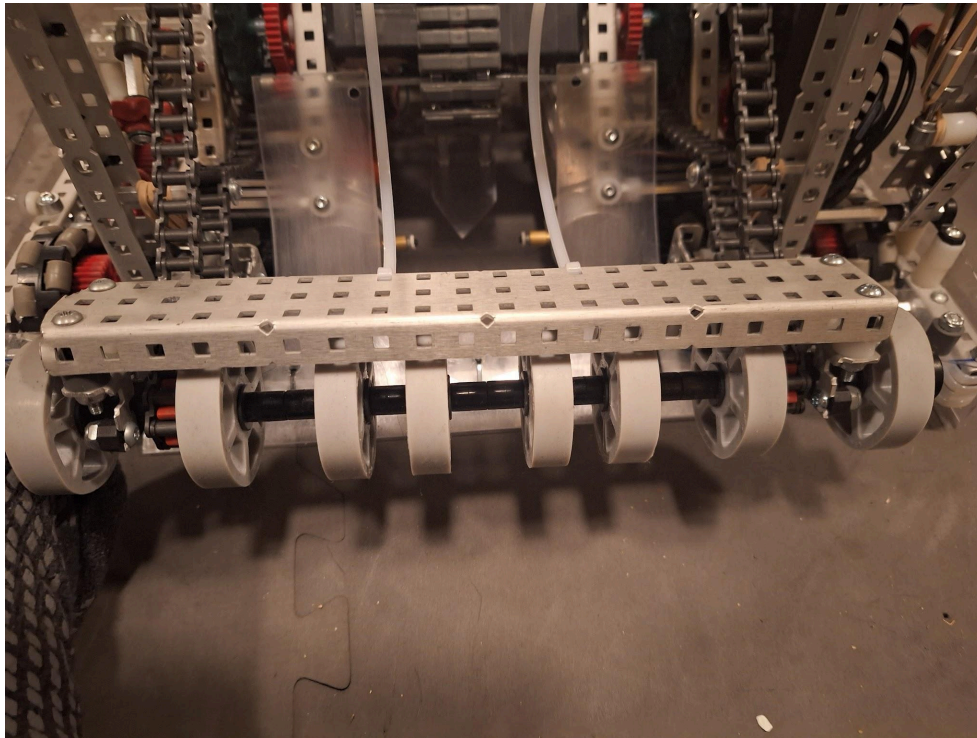
Next, we fabricated a polycarbonate sled to guide the rings toward the hook intake. This sled was carefully positioned at the front of the robot, ensuring the rings could slide smoothly into place. Simultaneously, we used CAD software to design the gearing system for the lower and upper intakes. Both intakes were powered by 200 RPM motors, with the upper intake geared at 36:12 and the lower intake at 18:6, resulting in a consistent speed of 600 RPM for both systems. This CAD design would serve as a blueprint for the next steps.



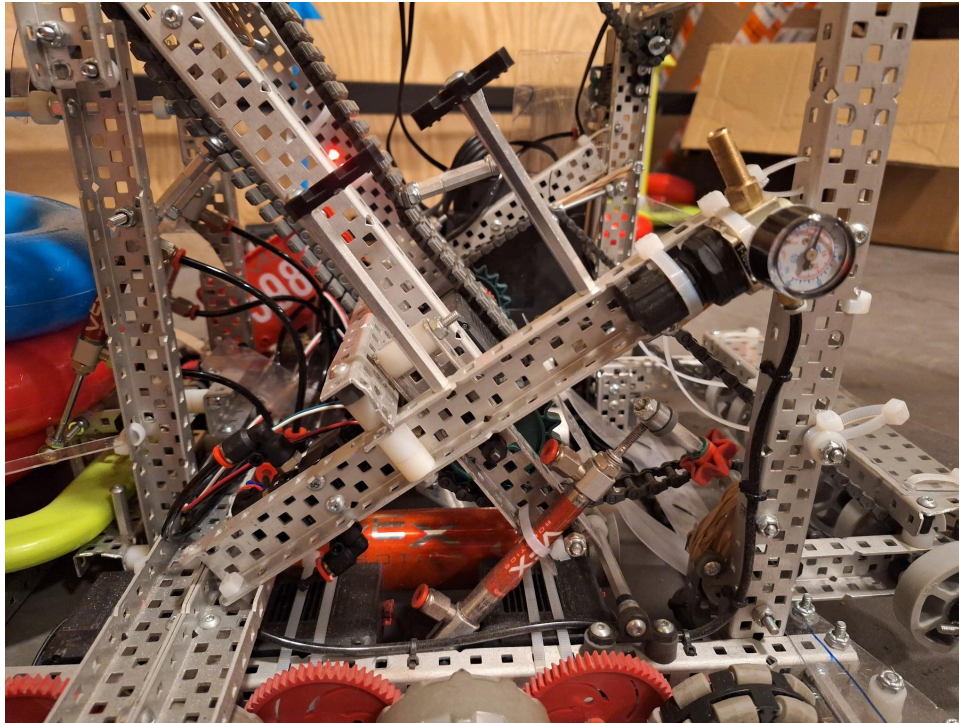
12/28/24:

Intake and Structural Reinforcement

On the second day, we shifted our focus to constructing the hook intake frame and assembling the previously CAD-designed gearbox. This step was critical in setting up the intake system, which featured a distinctive floating design. The intake was strategically mounted close to the robot's front for added strength and precision. Its position allowed the rings to seamlessly slide up the polycarbonate sled without disrupting the motion of the lower intake.



To improve the robot's overall durability, we introduced triangular bracing to the frame. This lightweight yet sturdy solution significantly enhanced structural integrity while minimizing the weight dedicated to the structure.



However, this innovative intake design also presented a new challenge: the chain would lose tension if the intake was lifted. Resolving this issue would become the next day's focus.

12/29/24:

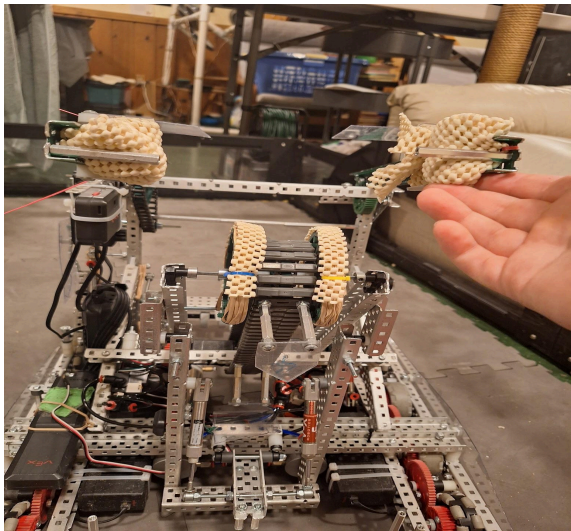
Problem-Solving and Testing

Day three was dedicated to making the lady brown(wall stake mech) and problem-solving and refining the robot's systems.

Scoring wall stakes has become a very important part of high stakes. We decided to overhaul our wall stake scoring as the hopper that we had wasn't working so we are going with a lady brown mech We then started to build the lady brown. The way it works is the intake spins and if the lady brown is in loading position the ring gets stuck in the lady brown, which

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then flips up and scores on the wall stake. See below for how the ring stays



in the lady brown

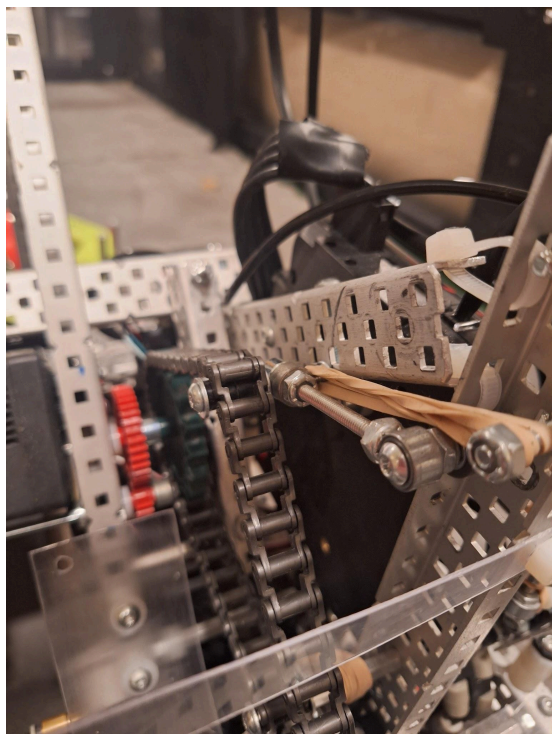
We are running the Lady Brown with a 5.5w geared motor. This works well because the Lady Brown isn't that heavy.

Testing the lady brown: we tested the lady brown 10 times and the results are below

Lady brown tests			
Test #			
1			fail ▾
2			fail ▾
3			success ▾
4			success ▾

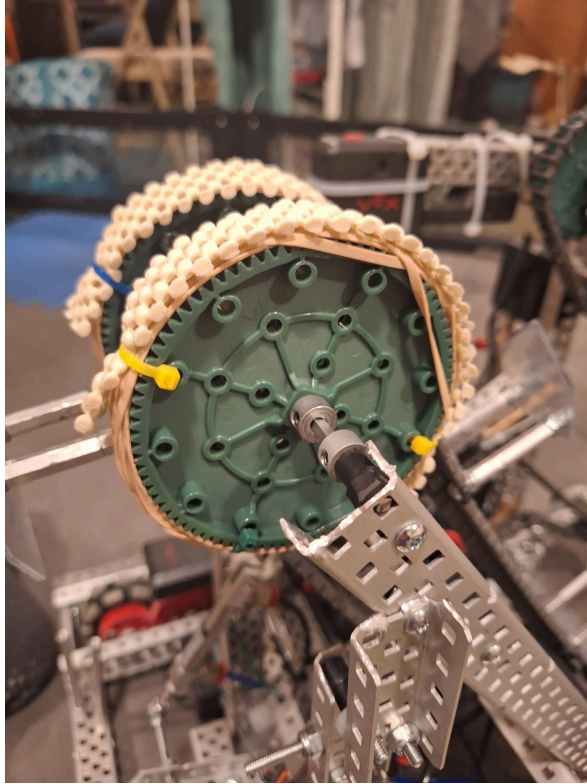
Lady brown tests			
Test #			
5			success ▾
6			success ▾
7			success ▾
8			success ▾

To address the chain tensioning issue, we implemented a rubber band screw tensioner. This clever solution ensured the chain remained tight, even when the intake was lifted, maintaining smooth operation.



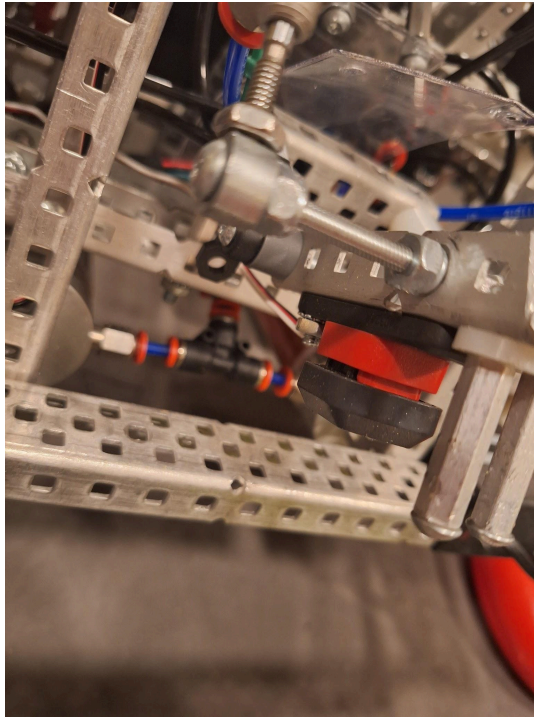
We then attached the upper hook intake and began testing its functionality. Through experimentation, we discovered that using larger gears at the top of the intake enabled the system to continue moving as rings were placed

on the goal. Wrapping rubber bands around these larger gears improved their ability to rotate rings effectively. This innovation enhanced the consistency and reliability of the intake.



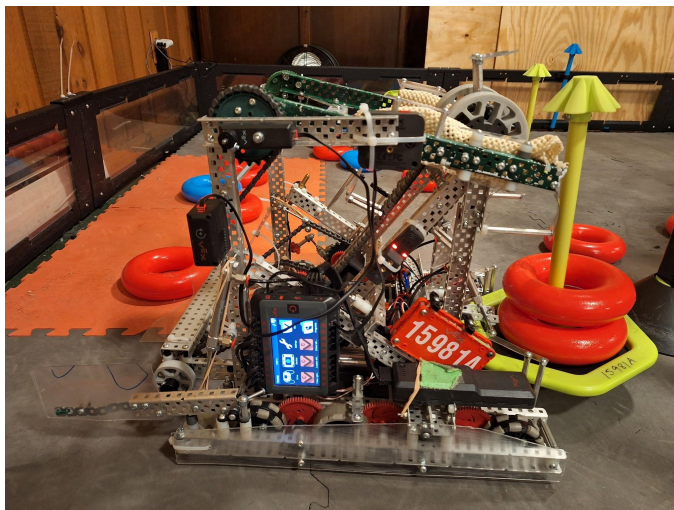
Another significant advancement was the development of a mobile goal clamp. This unique mechanism used a bumper switch to detect when a goal was beneath it and automatically clamped onto the goal. This not only

improved drivability but also demonstrated a high level of ingenuity in the



robot's design.

One of the problems we encountered was how to tune the intake and goal clamp to work together. The goal had to be tilted just right in order to score. It took many tries to get the intake work.



as you can see it is tilted so that the tips of the hooks just barely graze the tip of the mobile goal

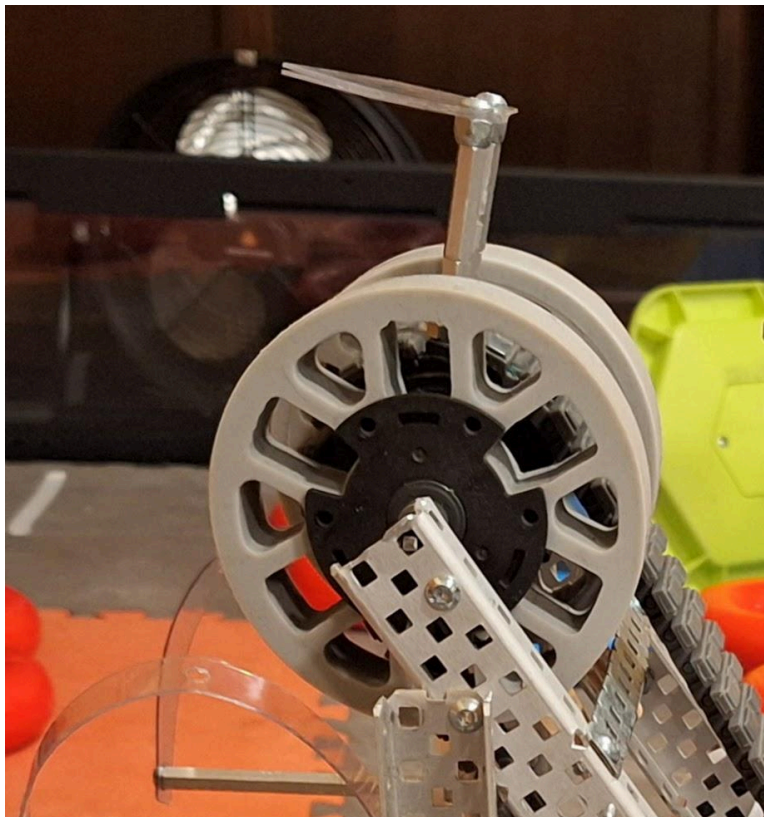
12/31/24:

Attendance:

1. Andy
2. Finley
3. Eben

Fine-Tuning and Adjustments

Fine-tuning took center stage on the fourth day. While optimizing the top of the intake for consistent performance, we faced a new challenge: the system's height had to be lowered to fit beneath the climbing bar. This adjustment caused issues with the rings not properly scoring on mobile goals. Using slow-motion video analysis, we identified that rings were bouncing off the gears meant to guide them. We resolved this by replacing the gears with flex wheels and securing them with rubber bands, significantly improving the system's reliability.



Additionally, we refined the rear goal clamp, making it sturdier and adjusting its tilt. This modification made it easier for the intake hooks to place rings on the goal, ensuring smoother and more efficient scoring.

(image before, image after)

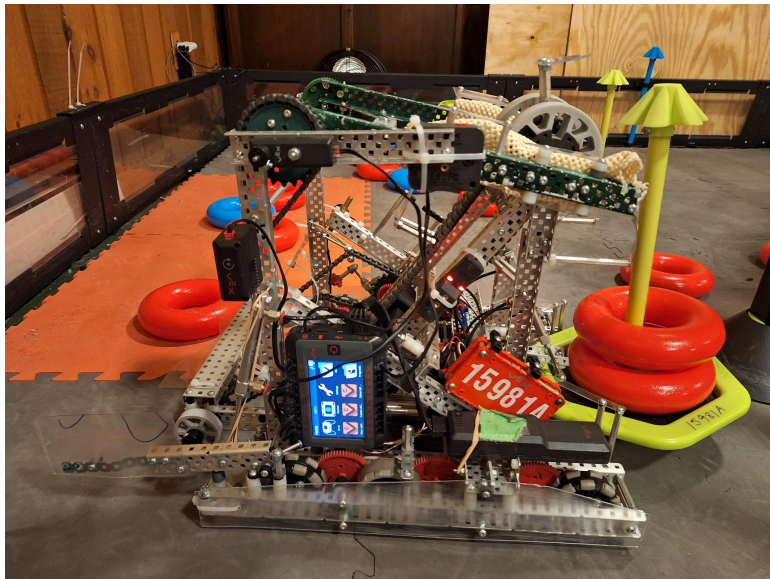
1/1/25 (happy new year!):

Attendance:

1. Finley
2. Andy

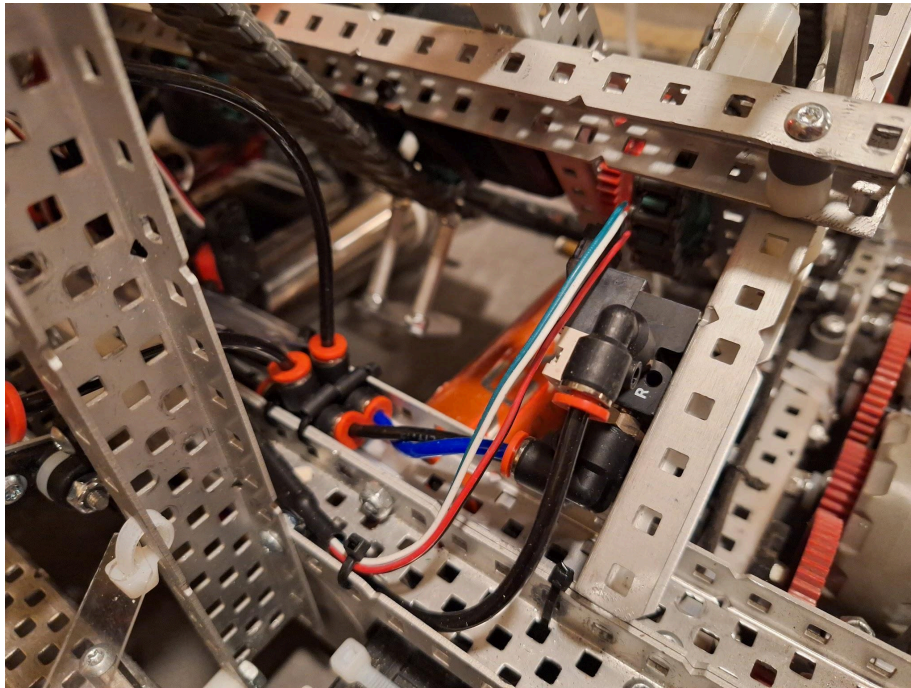
Final Additions and Polishing

On the final day, we focused on enhancements and final touches. We installed a doinker, to help scoop rings from the corners of the field. Its strong yet flexible mount absorbed impacts during use, while rubber bands on the solenoid automatically retracted it without requiring additional air.



As you can see above the doinker comes from the side of the robot and then we spin clearing the corners

We also added pneumatic tubing and two solenoids to power both the doinker and the rear goal clamp.



Experimentation continued as we tested a novel method for lifting the front intake by holding the chain and tightening it using the motors.

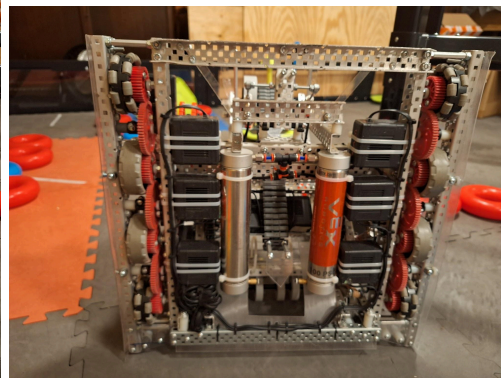
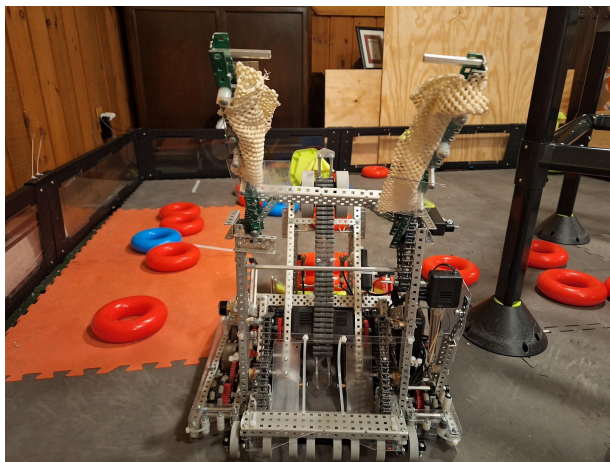
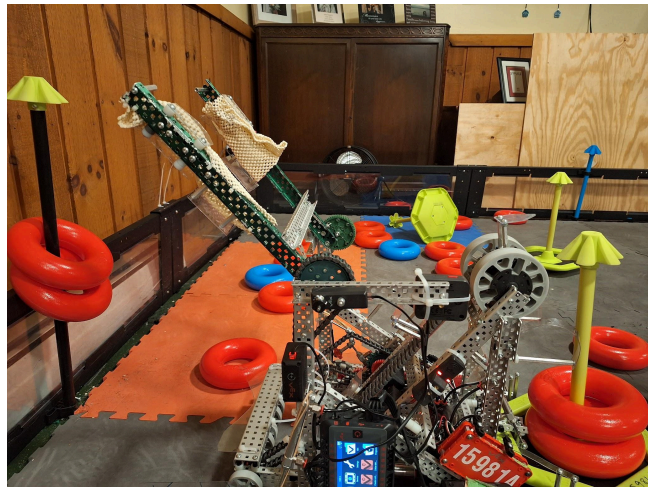
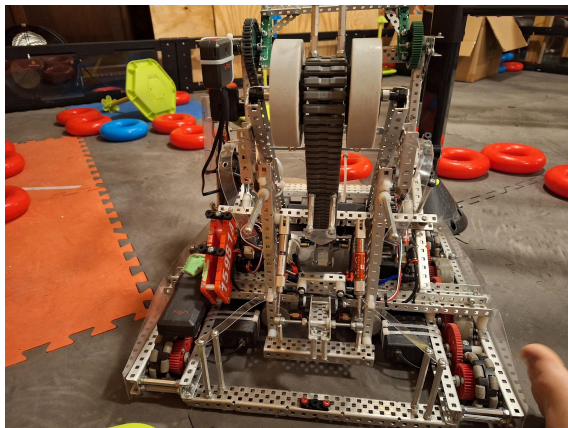
(image of intake lift)

Ultimately, we decided the intake could perform all necessary tasks while remaining lowered, eliminating the need for additional mechanisms. Instead, we secured the intake with zip ties to meet the 18x18 size restriction before the match.

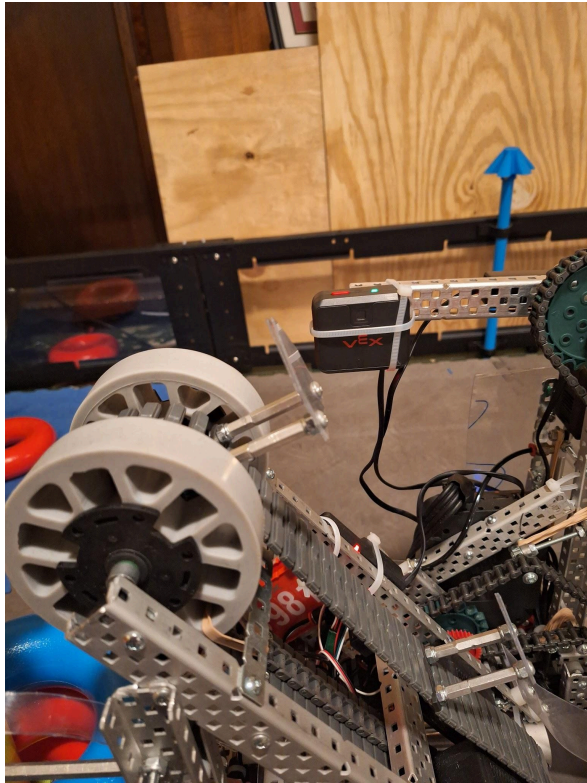
(image of zip ties)

Finally, we performed general polishing tasks: adding side panels, wire management, screw tightening, and extensive testing. These finishing

touches ensured the robot was not only functional but competition-ready.



Color sorting: we use a vision sensor to sort the rings from blue to red. The color sensor is mounted on the side of the intake.



We lost a match at the Mount Academy qualifier because we scored a ring of the wrong color, so we decided to implement color sorting. It is a simple process, but it helps our performance immensely. The code behind it is the more complicated part of the process. The code uses user input from the brain to select which color ring to sort and which auton to run.

The brain is split into 4 regions, if for example, you click the left blue it will toss red rings and run the left side auton.

The code involved uses the draw function to split the brain into 4 colored quadrants then it makes the brain touch sensitive and when you select a quadrant it uses the input from the brain of where you press and select an option. We also are using the old vision sensor for higher accuracy.

1/5/25

Attendance:

Dan

Andy

James

Finley

Sophia

Bella

Priorities

Sort materials

Fix lady brown

Practice a little

Fix lady brown code

Today we started off with a team meeting to get our priorities straight like most sessions. I chose to help Andy fix the lady brown. The problem with the lady brown was that it was not able to hold onto the ring. To fix this we had two ideas. #1 was to just add more padding so that the ring would stick better. And #2 was to add small standoffs to the end of the lady brown because the intake was propelling the ring too fast and it was going out of the lady brown that way too. After doing both those things we tested it (we tested it by taking a slow-motion video of what was happening to really be able to analyze it because the intake was moving so fast it was impossible to coherently tell what was happening with only the naked eye) and realized that it was still falling out just not as much, so we decided we could add plexiglass to the top because the intake would propel the ring so fast, it would hit the standoffs and go up. The one problem with adding plexiglass was that it would interfere with the intake. However, it seemed like it would be the only option if we wanted to score wall stakes. This was quite the predicament but then we had a crazy idea, what if the lady brown rested up instead of in the intake,



then it would not interfere with the intake, the only problem with this is that you cannot go under the middle backwards with the lady brown up or it will break but this is a very specific scenario and we can always just turn the robot around when going under the middle. Another result of this change is that the code needed to be changed to have the lady brown be put up at the beginning of the match but that is no problem to code.

1/18/25:(Fallsburgh qualifier)

Attendance:

1. Andy
2. Finley
3. James
4. Dan
5. Bella
6. Sofia

Today was the Fallsburg qualifier. We didn't have a fully functional robot as the intake was very finicky, it would work then not work. As our robot wasn't working right we did pretty poorly. We did make it to the quarter-finals and almost to the semi-finals.

Coach _____ Team member: _____ Pg

We found out that our practice field was incorrectly set up and so the wall stakes were lower on our home field than on the competition field. This meant that the lady brown was obsolete. We immediately knew what we had to do, which was to move everything up on the lady brown so that we had the reach to score wall stakes.

Qualifier #2	Jan 18th at 10:07 AM	9717A	88188A	24	15981A	97140A	8
Qualifier #13	Jan 18th at 11:05 AM	15981A	88188B	24	19383E	10504A	3
Qualifier #17	Jan 18th at 11:27 AM	6277A	24842B	26	19383D	15981A	16
Qualifier #23	Jan 18th at 11:50 AM	19383B	6277D	18	15981A	19383A	25
Qualifier #37	Jan 18th at 1:04 PM	15981A	99561B	14	97140B	32563A	17
Qualifier #44	Jan 18th at 1:38 PM	15981A	6277F	22	10504B	9717B	6
QF #4-1	Jan 18th at 3:14 PM	6277C	6277F	26	19383A	15981A	17
R16 #8-1	Jan 18th at 2:49 PM	10504C	10504A	12	19383A	15981A	13

Rank

25

WP / AP / SP

4 / 6 / 47

As you can see we did pretty well considering we barely had a working robot.

Match 1: In qualifier 2 we lost pretty badly to a long island team however we did score most of our teams points and we realized that considering our schedule we could do pretty well.

Coach _____ Team member: _____ Pg

Match 2: in qualifier 13 we did much better actually winning 24-3, it was a well played match all around and we managed to outplay the opposing alliance with relative ease. A highlight of the match was that we loaded a full goal into the positive corner:

Match 3: this was the first close match we played in, we barely lost, the score being 26-16 the reason we lost is because our alliance had a robot that could barely move. If we had been with a decent team, we definitely could have won it.

Match 4: this was by far the best match of the day, we were playing a very good team. The first place team(at the time) in fact, their alliance was a decent team, and for our alliance we had two decent robots. We won 25-18 and this did wonders for our rankings.

Match 5: this was an extremely close match. The result being us losing 14-17. There was nothing remarkable about this match. The opposing alliance just had a few more rings.

Match 6: this was an easy victory for us we were with a great team and we played well the final score was 22-6 in our favor. We had a fully loaded goal in the positive corner and we played defence there.

Elims 1: in the round of 16 we were about evenly matched with the opposing alliance the match was even up to the very end when we put an extra top ring on the 5th mobile goal(this being worth 3 points) in the end we won by one point 13-12.

Elims 2: in this match it should not have been as close as it was we were facing two very good teams and it came down to the auton bonus. The highlight of this match was that we managed to steal a goal and put it in the negative corner.

Overall this was a pretty good tournament. We won a elims match and managed to pull ahead in a lot of our matches. We decided that we were

going to work that night to fix our intake and wall stakes see next entry for what we did.

1/18/25(night work session):