Engineering Notebook

75019H

Team Number

Autobots

Team Name

Coppell High School

School

09/03/2024 03/01/2025 1 of 1

Start Date End Date Book #

V3.0 Date 6.10.24

VEX ROBOTICS

REC FOUNDATION

Team Roles

Team -

1. Shiva Pachipala(Builder)

2. Neerav Puppula(Pneumatics)

3. Sam Dondapati(Builder)

4. Arnav Gupta(Programmer)

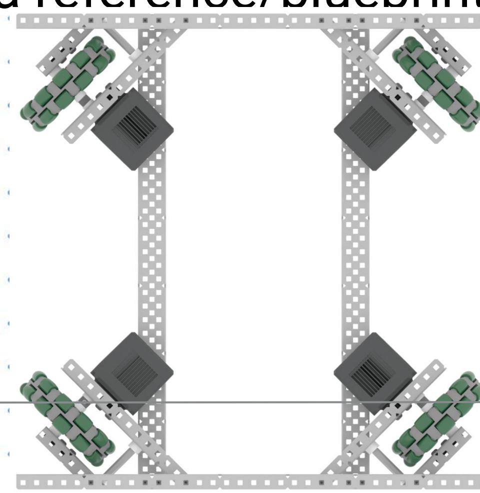
5. Dhruv Gandhi(Documenter)

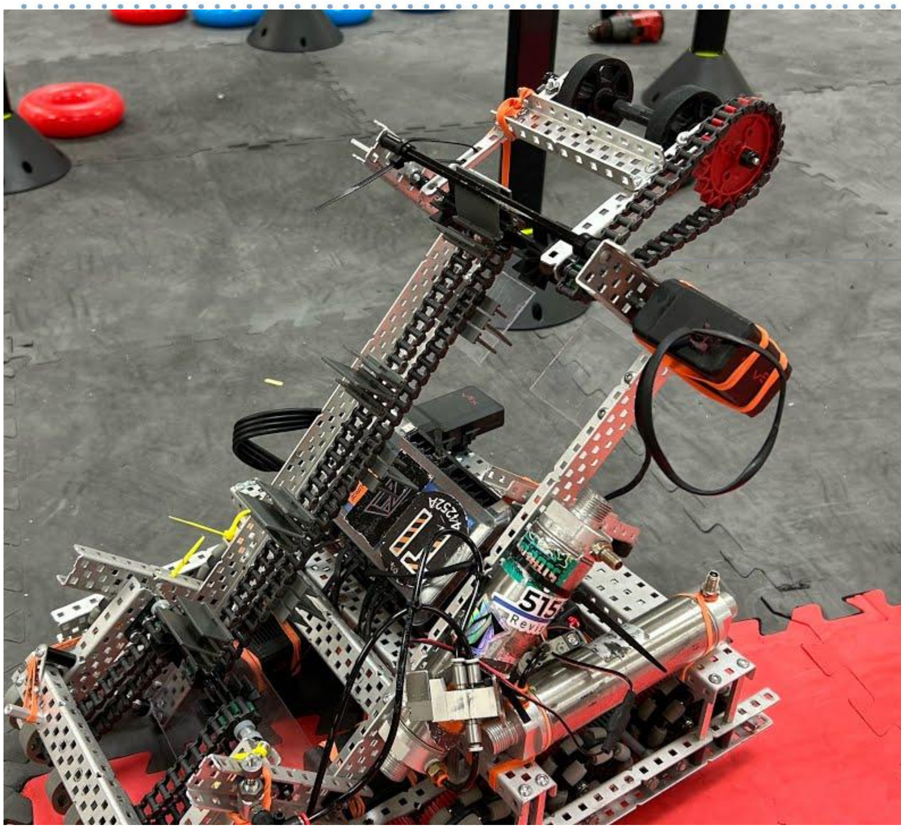
6. Geetesh Chitturi(Documenter)

Table of Contents

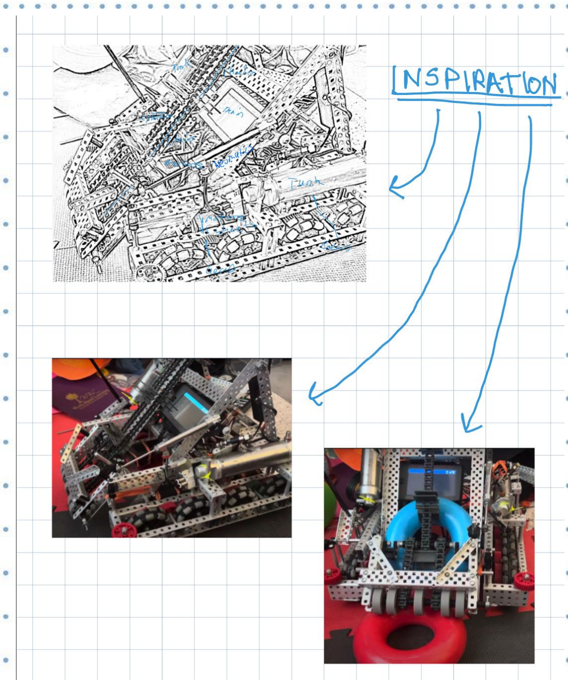
Brainstorming and Designing

Today we started the process of designing our blueprint. After discussing, we decided to add a conveyor belt mechanism to our robot that will vacuum up the rings and place them onto the stake. After examining different types of drivetrains, we came to the conclusion of adding x-drive system. This will help the robot to easily maneuver, turn and accelerate faster. The images below are not from the actual robot. It is just a reference/blueprint.





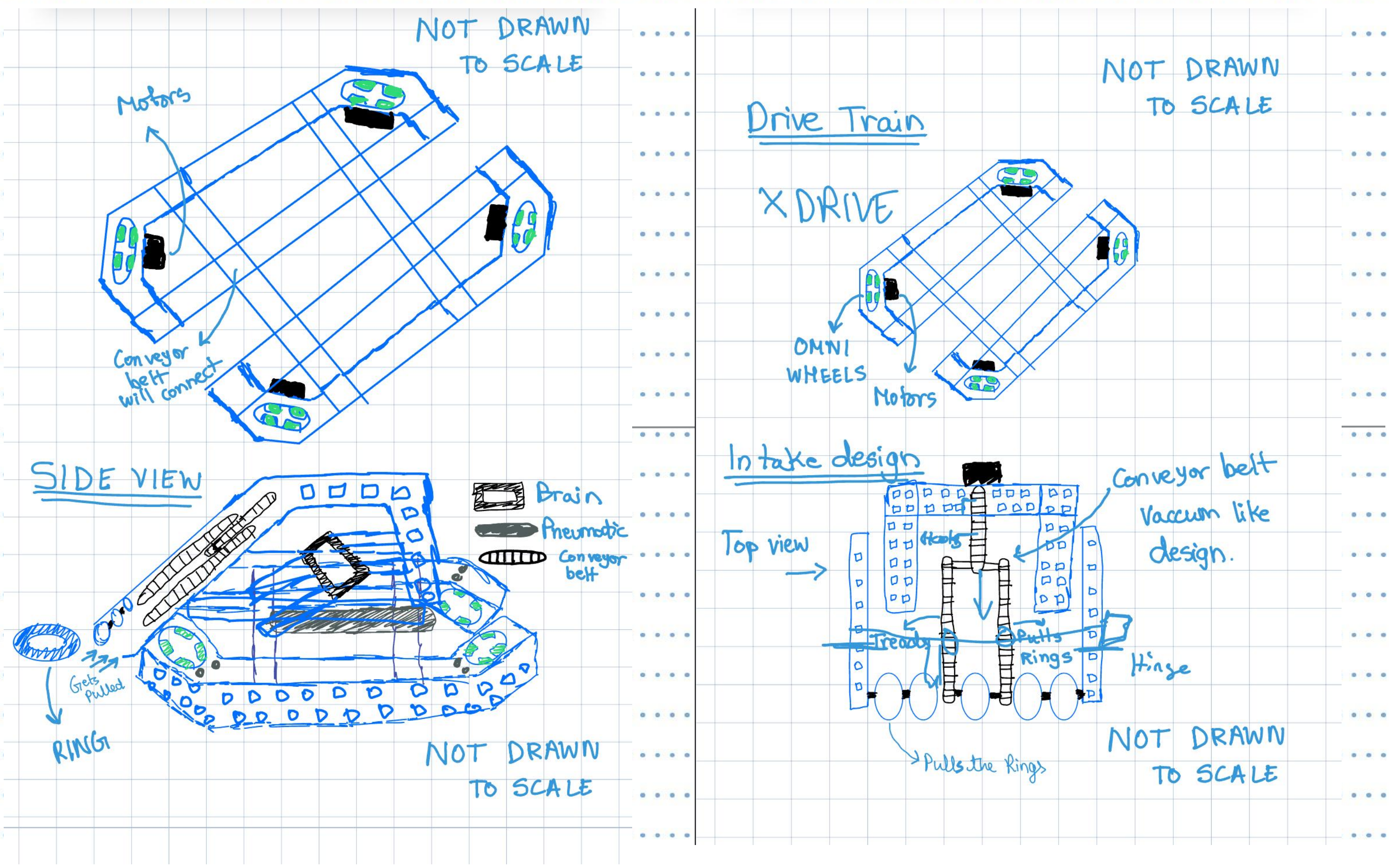
This robot has been used for inspiration



Project Blueprint and Research

Name Autobots Date 8/3/2024

Below, the images show the blueprint that we drew to help us stay coordinated and understand exactly what we are building. We designed this while keeping in mind a lot of things like maneuverability, acceleration and braking. We took inspiration from some of the top teams for vex online. Watching them made us understand the challenges our robot might face so we designed our robot accordingly to counter those issues.



In the images above we can see the blueprint that has been established to help build the robot according to plan

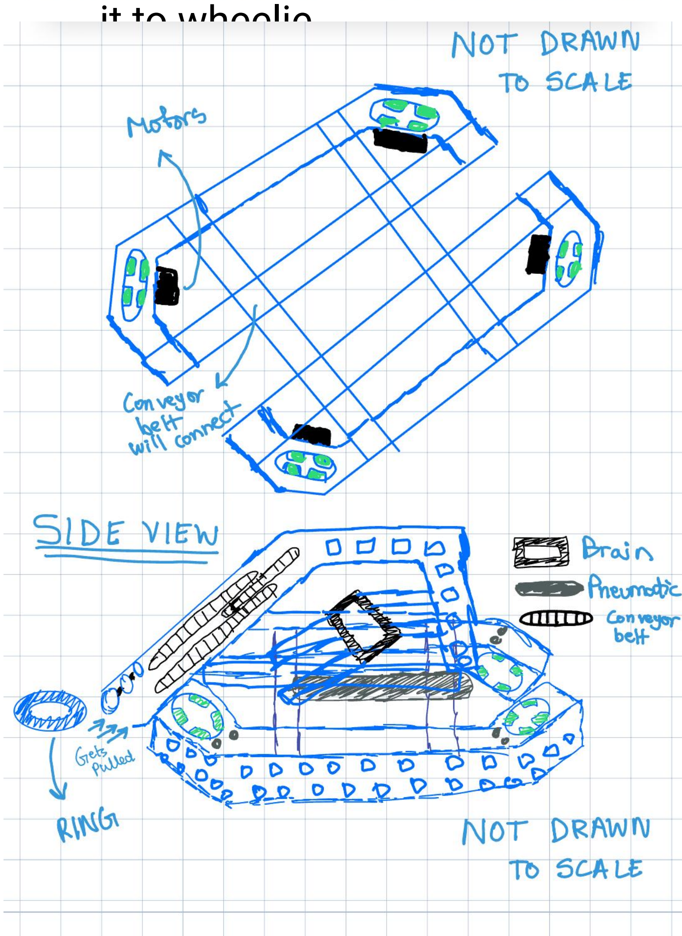
Project Blueprint and Research

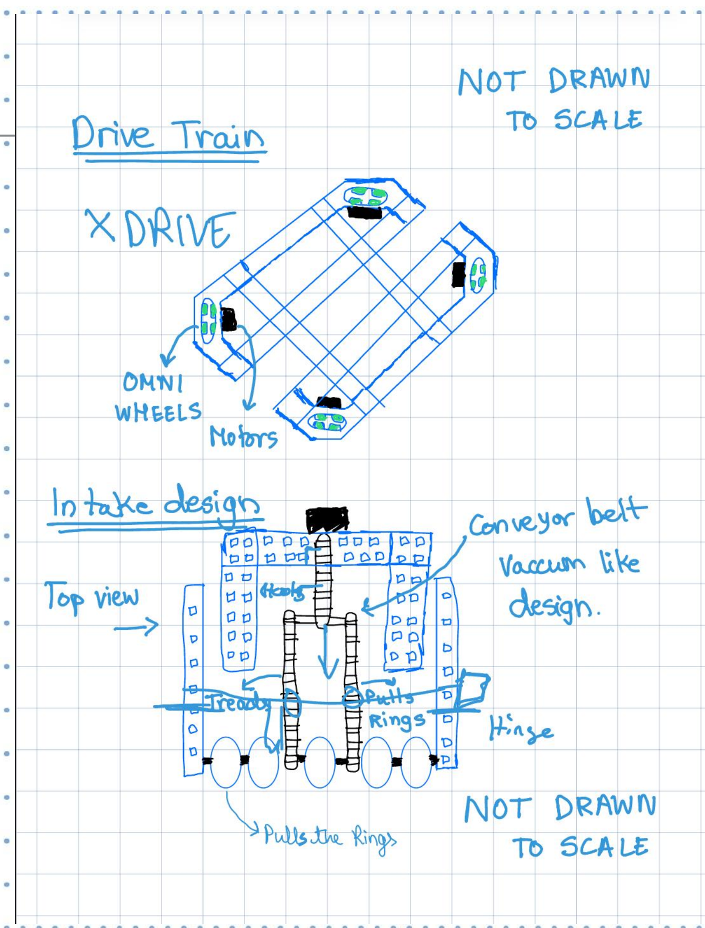
Name Autobots Date 9/3/2024 Page 5

Below in the image we can see a 4 wheel drive which provides better maneuverability and better acceleration. We also plan on making a conveyor belt out of tracks to ensure that the ring goes up the stakes smoothly and freely. We also plan on adding an intake to ensure that the ring get to the conveyor belt in the first place. We also plan on adding a back hook to hook onto the stake and keep the stake with the robot to put the rings on it. The intake will consist of motorized flex wheels, these wheels will rotate inward hence moving the ring inwards and slightly up where the conveyor belt is ready to pick it up and put onto the stake.

Now here are some of the challenges this drivetrain and conveyor belt might face:

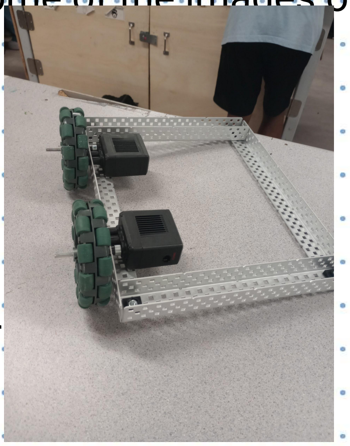
1. The drivetrain might drift due there only being 4 Omni wheels
2. The conveyor belt might miss the stakes because of there nothing to control ring speed
3. The bot will shift its weight towards the heavier side during acceleration causing it to wheelie





Drivetrain Building

Today we spent our time doing the first step of building a robot which is building a drivetrain, unfortunately we did not have the right parts to make the x drive system so we are sticking to the normal drivetrain pattern. We connected 2 motors to 2 wheels, and we plan on finishing the drivetrain by tomorrow. We also plan to start coding and configuring the drivetrain to function properly. Below here are some of the images of us working on that drivetrain and 2 images of the half Completed drivetrain. As of now it has 2 motors and square frame and 2 wheels. We choose the square frame because we knew that will would a strong choice and would easily support the robots weight in the future. Meanwhile 2 of the people in Our group were working on familiarizing themselves with vex code and how to use it properly. We tried to come up with better ideas but none of them worked out for us. But 4 wheels drive System seems to be the best for now so we will be using it.

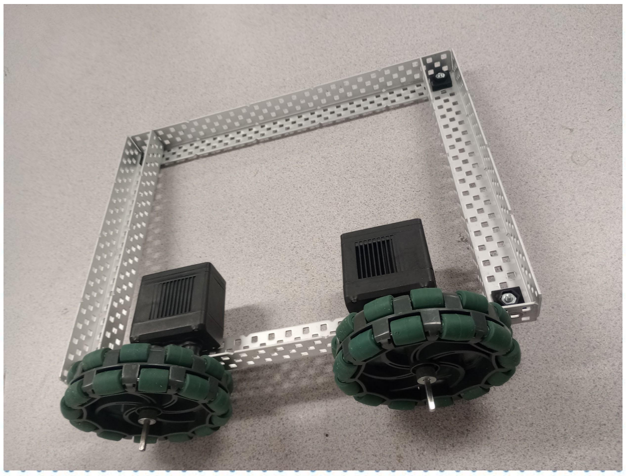


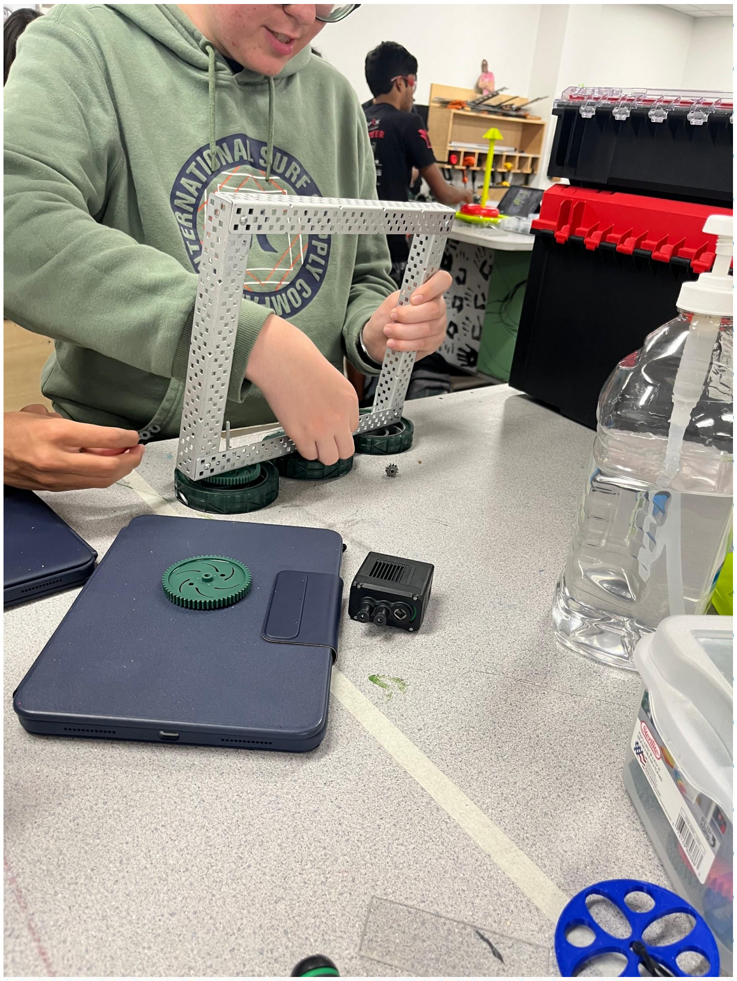
Advantages:

1. Easy to build
2. Lower weight

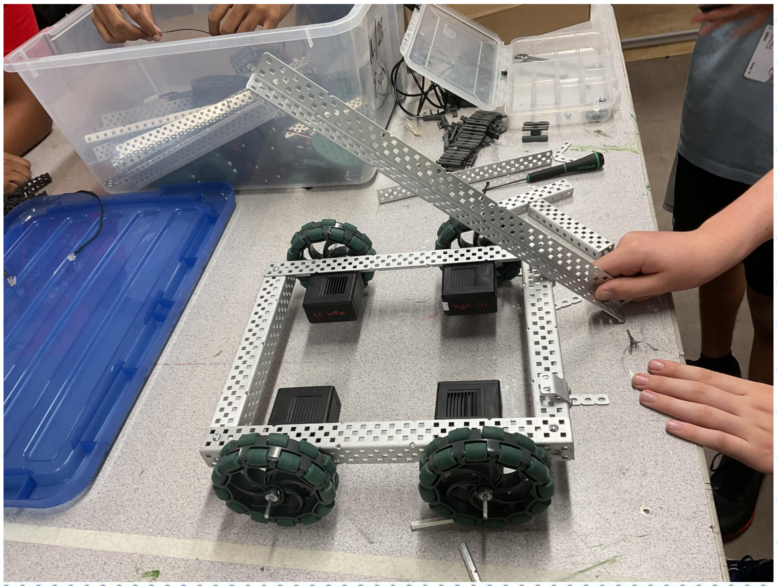
Disadvantages:

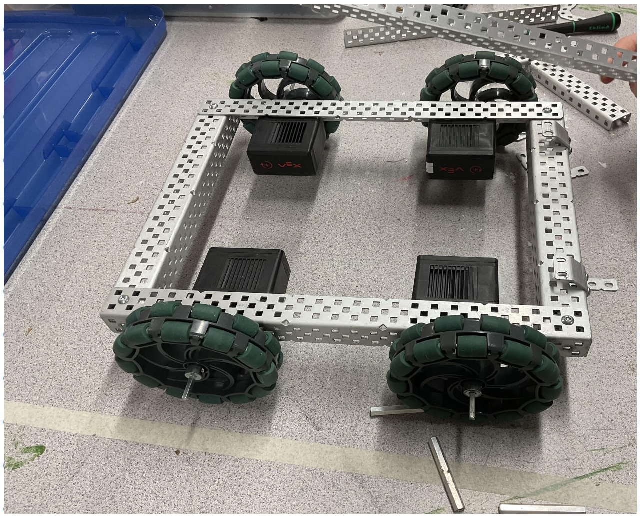
1. Wheel drift
2. Bad utilization of torque





Today we successfully finished our drivetrain of the robot, we connected all 4 wheels and 4 motors in the base of the robot. Our next step will be to add the intake which will be a conveyor belt that will take the ring to the pole. Below are some of the images of the finished drivetrain and the place where we plan to add an intake for the robot. We will step into programming the drivetrain and etc once we get our brains for the robot. We also spent some of our time trying to master the Vex code app and how to code inside it. It is a bit difficult because of the laptops, and their bad functionality. We will overcome those small obstacles.





Project Drivetrain finished

Name Autobots Date 9/11/2024 Page 9

We tried to come up with other drivetrain ideas such as this one where tried using 6 wheels instead of 4 to maybe help the robot distribute the torque more evenly across all its wheels to allow for stronger grip which leads to faster acceleration. We have tried many gear combinations and many different wheel placements but none of them worked out very well. As some of them had launch issues and others had turning issues but overall the 4 wheels drivetrain seemed the best because it had everything equally like turning and acceleration. This 4 wheel drive is not the best but we don't have enough time to come up with a new drivetrain concept. As we will get started on working on the intake and hook. We have rough ideas on how and where the intake will be placed, same goes for the hook system. We plan on adding the hook in the back middle and the intake in the front with flex wheels moving the ring towards the conveyor belt.

Project Drivetrain

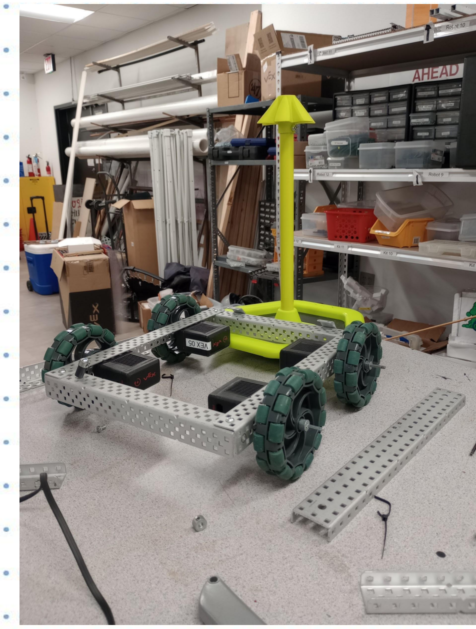
Name Autobots Date 9/1124 Page 10

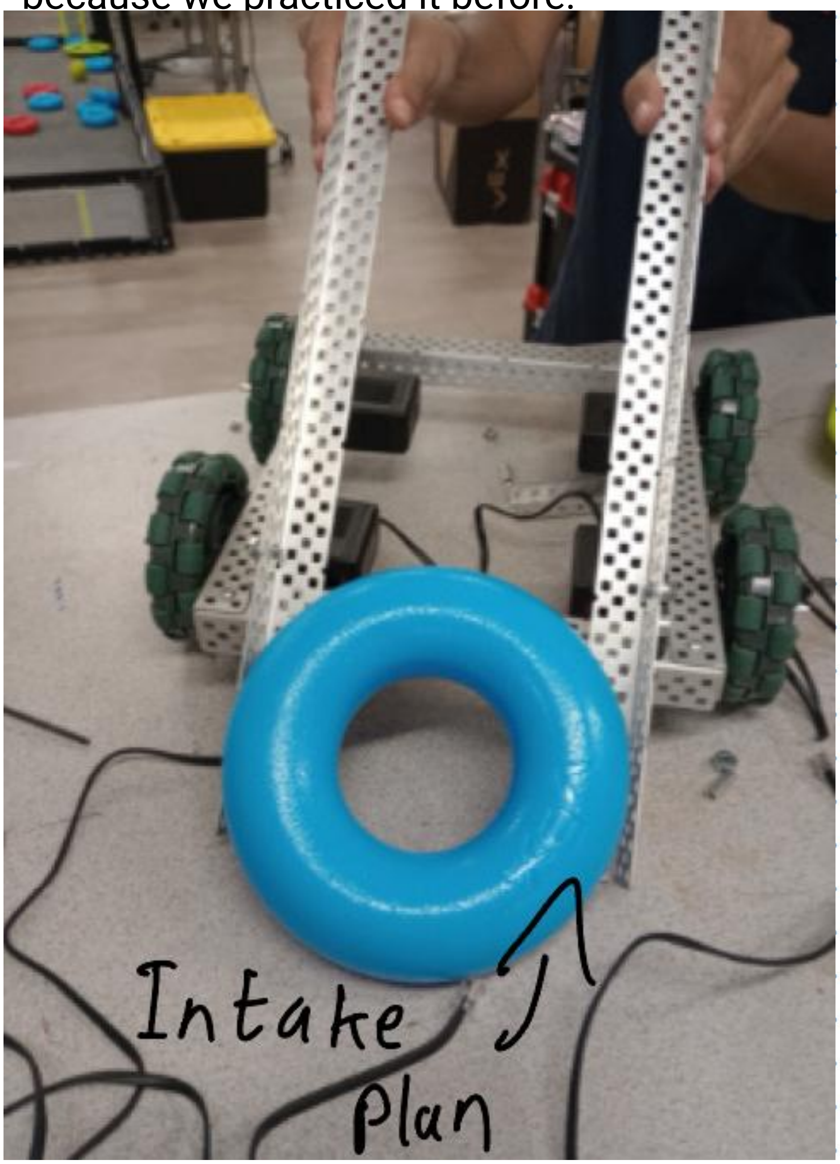
WEEKLY REPORT

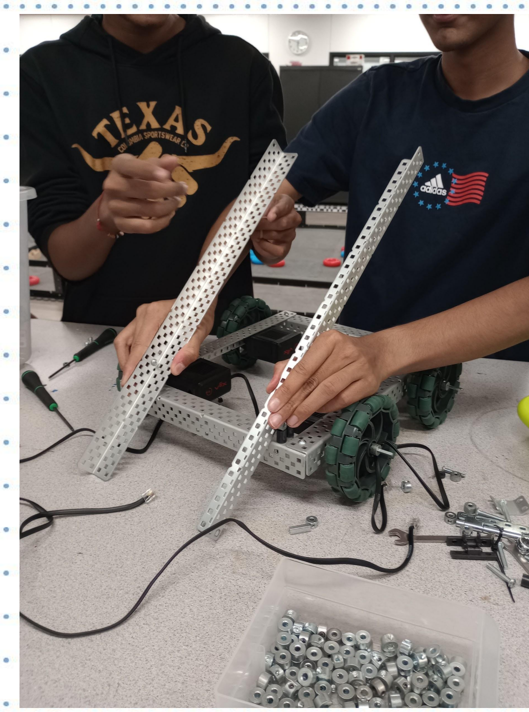
Today we successfully completed the drivetrain of the robot, which marks a significant milestone in our build process. The drivetrain consists of four wheels and four motors, securely attached to the base, providing the foundation for the robot's movement. This stage was crucial as it determines how the robot will navigate during operation. Our next focus will be on integrating the intake mechanism, which is designed to function as a conveyor belt system. We also have a scarcity for C-Channels and U-Channels which made us switch from our x-drive (drivetrain design) to a standard drivetrain due to the lack of resources only. We would also like our brains and etc to be given to us as soon as possible so that we can start programming the drivetrain and start practicing to code first hand. Other than those issues I have addressed, we are doing really well. And we are on track to finishing on time if not ahead of time. Thanks you for your support at the leaders of the Vex robotics program.

Intake Brainstorming

Today we continued building on our intake. This conveyor belt system will bring the ring to the yellow thing. We also tested our motors and we were successfully able to control our robot. We can confirm that our drivetrain works well. We plan on finishing the intake soon. We have also been working on familiarizing ourselves with vex code so that when it’s time to code the actual robot we would already know how to do it because we practiced it before.



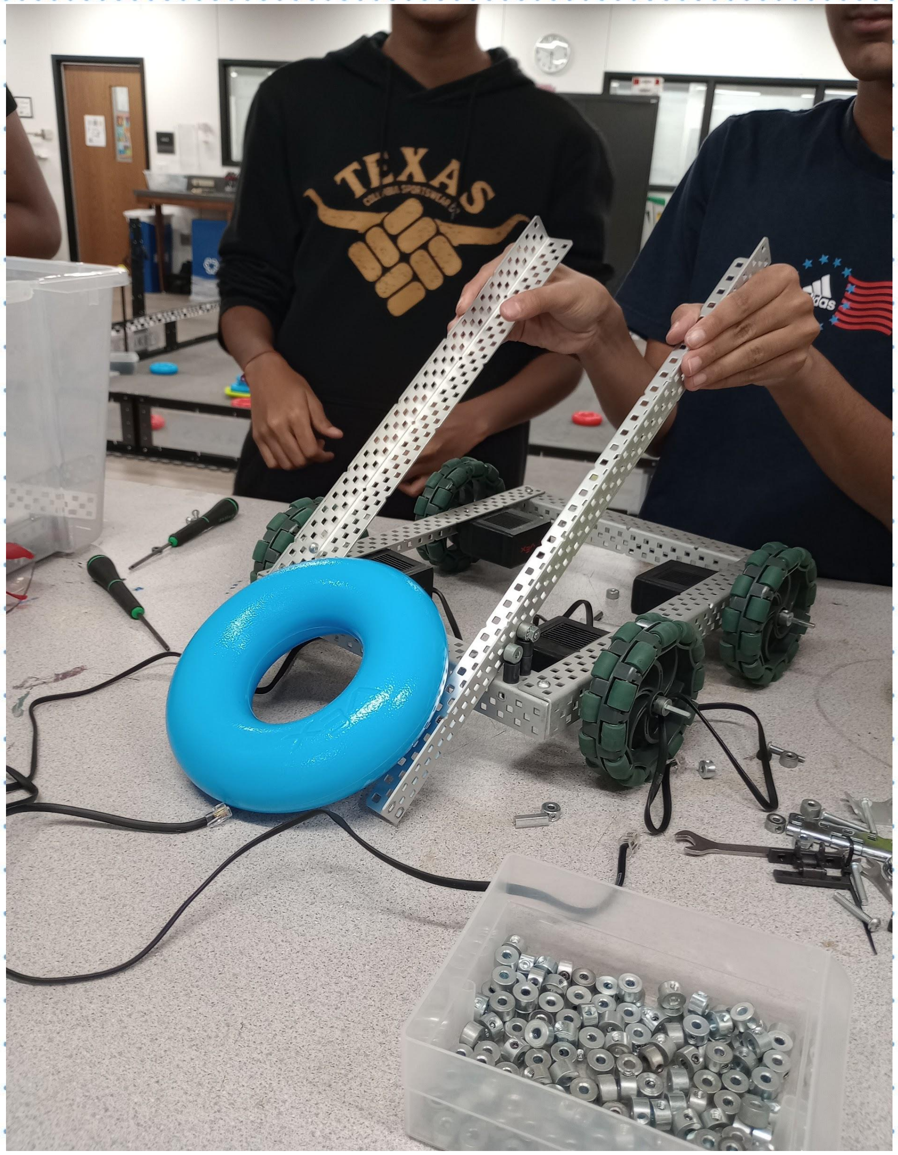




Project Intake brainstorming

Name Autobots Date 9/18/2024

Today we continued building on our intake. This conveyor belt system will bring the ring to the yellow thing. We also tested our motors and we were successfully able to control our robot. We can confirm that our drivetrain works well. We plan on finishing the intake soon. We have also been working on familiarizing ourselves with vex code so that when it's time to code the actual robot we would already know how to do it because we practiced it before.



- Continued working on the intake system, refining the conveyor belt mechanism.
- Successfully tested motors and established control over the robot.
- Confirmed that the drivetrain operates effectively.
- Aiming to finalize the intake system soon.
- Practicing VEXcode to be well-prepared for programming the robot.

Project Intake brainstorming

Name Autobots Date 9/18/2024 Page 14

Hook Building

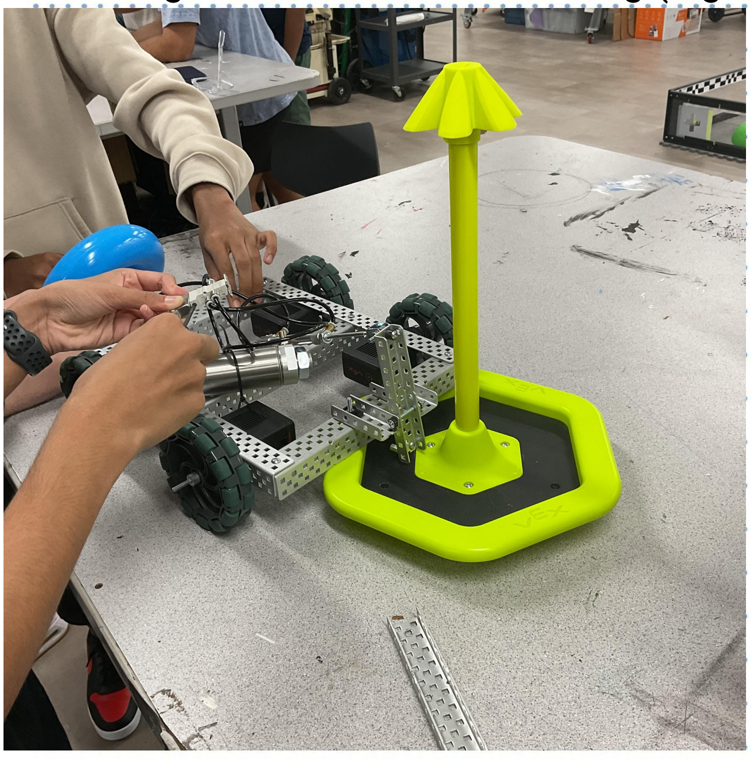
We temporarily put inside our intake project, and we started working on our pneumatics, that will clip onto the stake to ensure that it does not move anywhere when the intake is taking in the rings. The pneumatic works perfectly and locks the stake perfectly onto the robot so that the rings can go onto the robot easily. We have also tested how many pumps a refill of air in the pneumatic lasts, it lasted about 25 pumps which was really good and more than enough for competing. Meanwhile we were also familiarizing ourselves with rules and strategies. After some thinking we have decided to not go for the top ladder instead we will just hang on to the bottom one for a couple seconds because we thought it would gain us more points to just gather the rings than climbing the top ladder. We also thought that it would be faster.

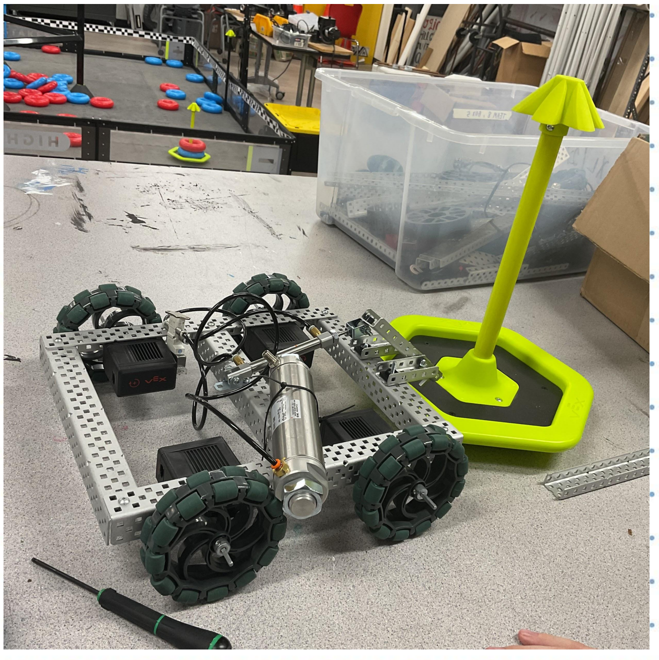
Advantages:

1. Hooks onto to the stake firmly. Very powerful
2. Quick, since its air pressure the hook is almost ballistic

Disadvantages:

1. Air might run out soon -> Leading to the need of 2 tanks
2. Might not work if wired wrong (higher chance of failure)

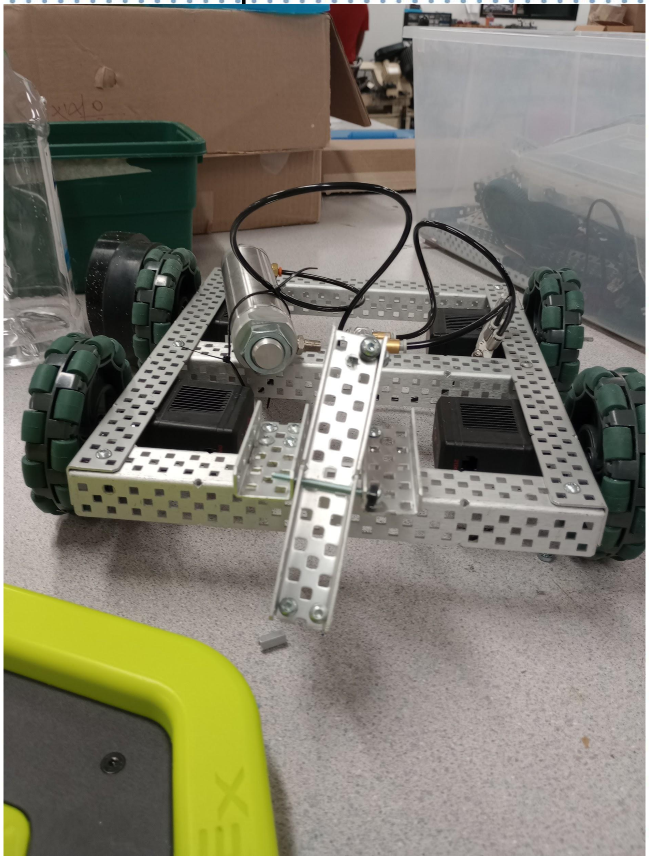


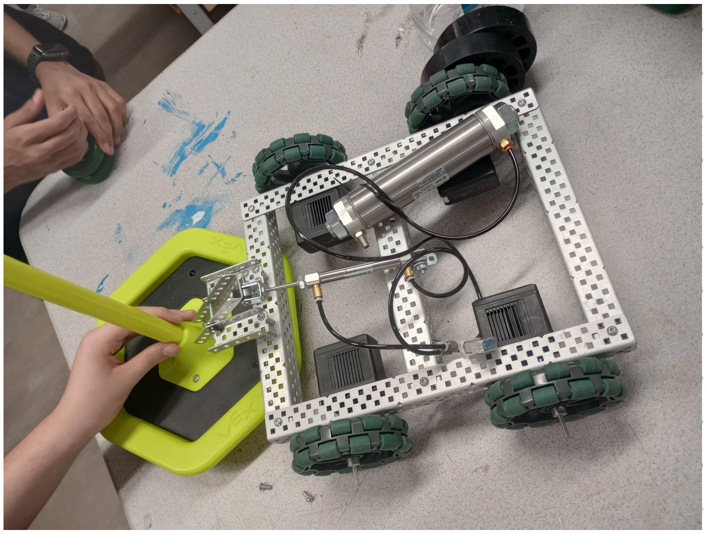


Weekly Report

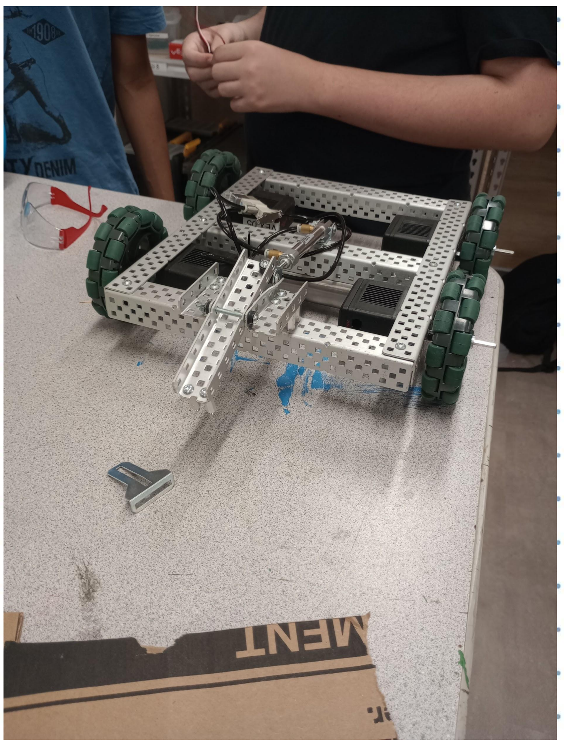
This week had been a great week at vex robotics for us, we were able to brainstorm on a lot of stuff, we came up with some great ideas that we will be using like the conveyor belt intake, the drivetrain system. Our plan for next week is to probably going back to building the intake for the robot, because instead of finishing the intake this week we thought it would be better to put that plan aside and work the clip like system that will grab and hold the stake so that we can put the rings in it. Working on this first allowed us some good amount of space and probabilities. We have built and tested the pneumatics; they work really good. A single refill lasts us 25 pumps which more than enough for competition in our opinion. On the software side, we have been exploring the vex code for and we have also been reading the game manual to find places where we can gain a quick advantage. For example: We have chose not to go for the top ladder, instead we are going the rings and the lowest ladder where we hang on for a couple seconds, we estimate that this will be a faster and more efficient way to get all those points in the short time frame provided to us in the competition. Overall we are on track to finishing the robot, in fact we are ahead because we finished our drivetrain long ago. Looking forward to improve our robot next week.

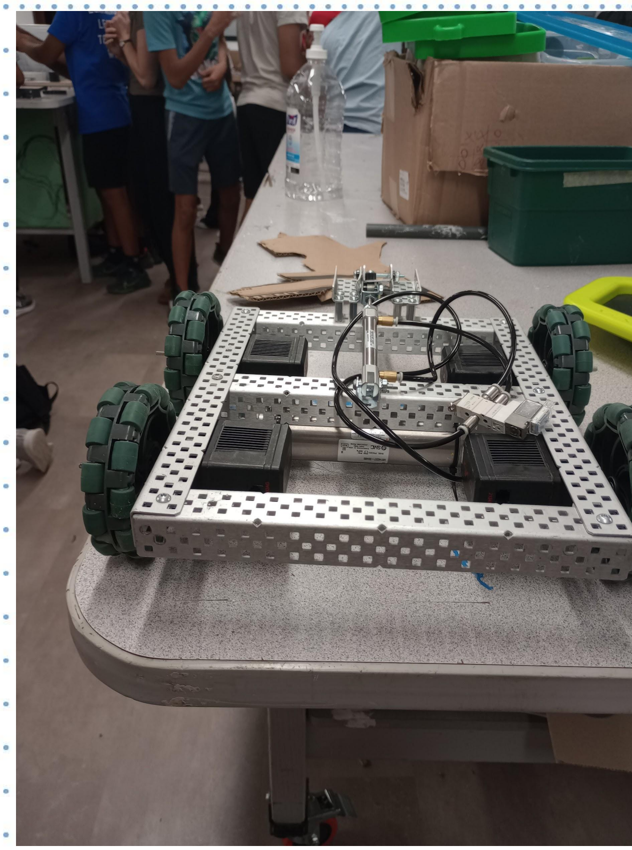
Today we did not do much, as a couple member from our team were somewhere else. All we did for today is upgrading the hook that will grab onto the stake and hold it there so the robot con put the tings on it without the stake moving away from the robot. We made the pneumatic stronger and faster, to ensure the grip is really tight we also added guard rails to make sure the stake does not rotate. Also we were discussing in our group and taking advice from a leader we are thinking about adding a skateboard wheel in between front and back tires on each side. We believe that this will stop the robot from drifting when we hard brake or turn, because our wheels have mini wheels in them on the top, we have decided that this would be a great addition to the robot. As always we are slightly ahead in terms of our robot. We are just looking forward to our brains so we can start coding and testing the motors and exploring how they move based on torque ane etc.

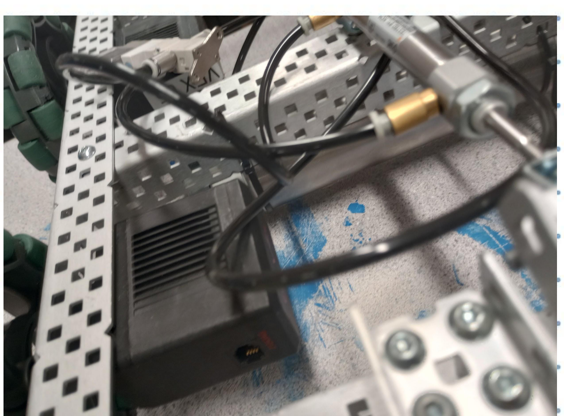




Due to the shortage of time today we couldn't get too much done today. All we did today was again upgrading the hook of the robot to better grab the stake. Other major thing we did today was changing the pneumatic tank to the bottom of the frame of the robot. We believe that this will help distribute the weight of the robot equally. We also believe that doing this would result in more space in the center of the robot. Meaning that this is extra space for the intake and the brain which is really useful and required. We also changed a few nuts and bolts but nothing crazy.







Project Pneumatic tank change

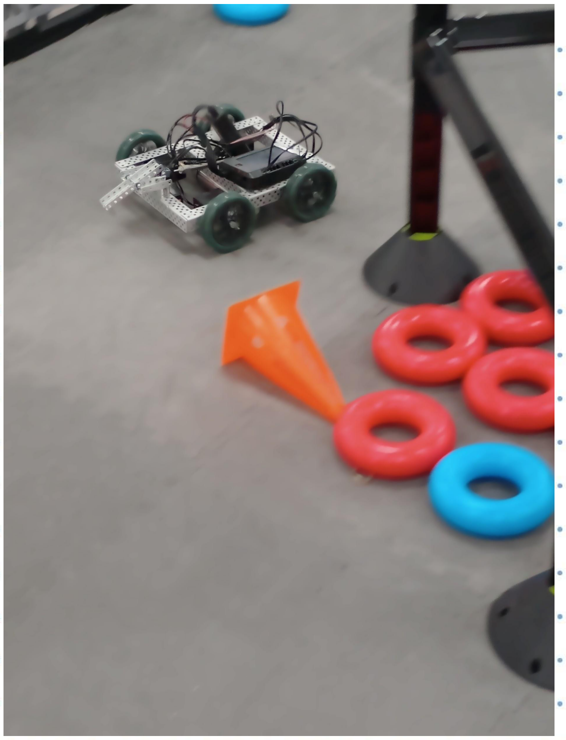
Name Autobots

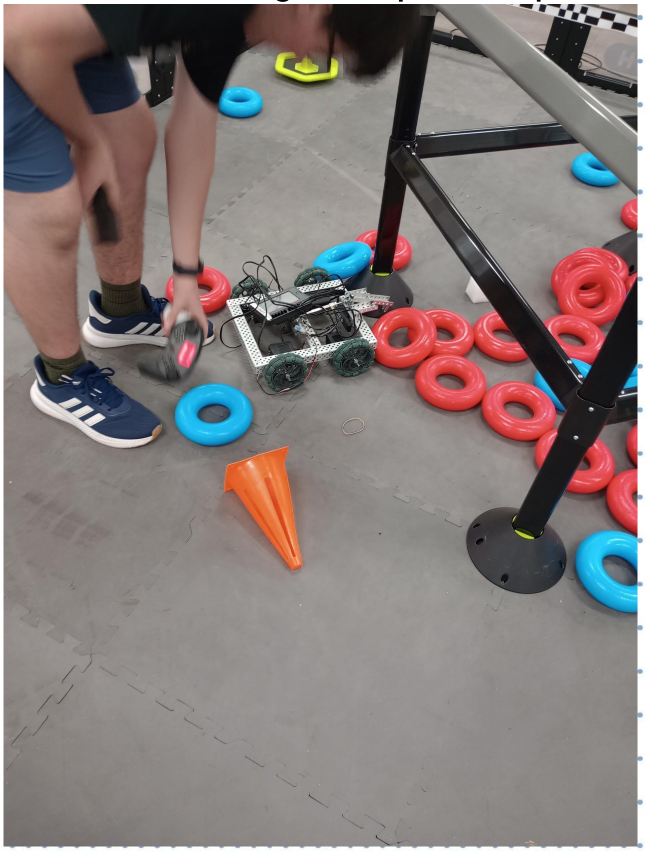
Date 9/25/24

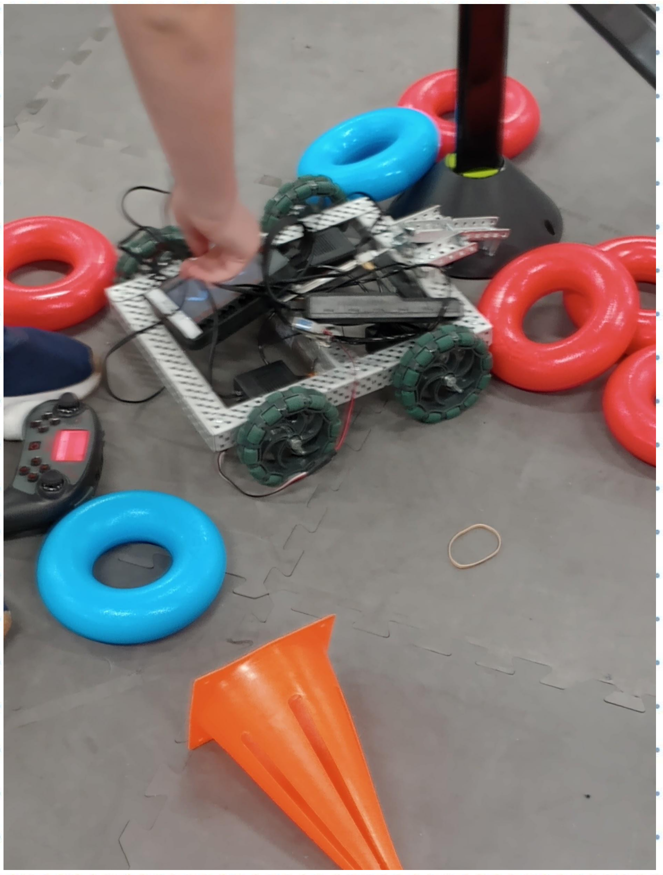
WEEKLY REPORT

This week was just an another week in Vex robotics, we did not do anything game changing. All we did this week for some small upgrades which will add up in the long run we believe. For example making the hook right now leaves us with more space to add the intake and the brain. We had a couple team members missing the work time which was another reason for this week's slower progress. We also changed our pneumatic tank from the center of the tank to the bottom of the robot because we believed that this would result in better weight distribution and better performance from robot while leaving extra room for the brain and intake of the robot. We are looking forward to a great week next week because we have some great plans and design ideas that might change the entire robot, like the new intake and new smaller wheels on the side to prevent our robot from drifting during a sharp turn

Today we did not do much because our team was busy goofing off. We were stress testing the hook to make sure none of screws or bolts are loose. We also borrowed someone else's brain to test out our motors. Our motors are really good and the robot is really fast. Sam decided to zip tie the brain and dock to the robot turn out it is not really a good idea because the brain went flying when the robot was going really fast. The brain and dock disconnected from our robot so that was the end of our motor testing. The stress testing of the pneumatics made us refill the tank every 2 minutes. We also made our hook tighter and faster even though it's already ballistic. We plan making the hook stop at a certain angle so that the stake is always positioned right no matter what angle we pick it up from.

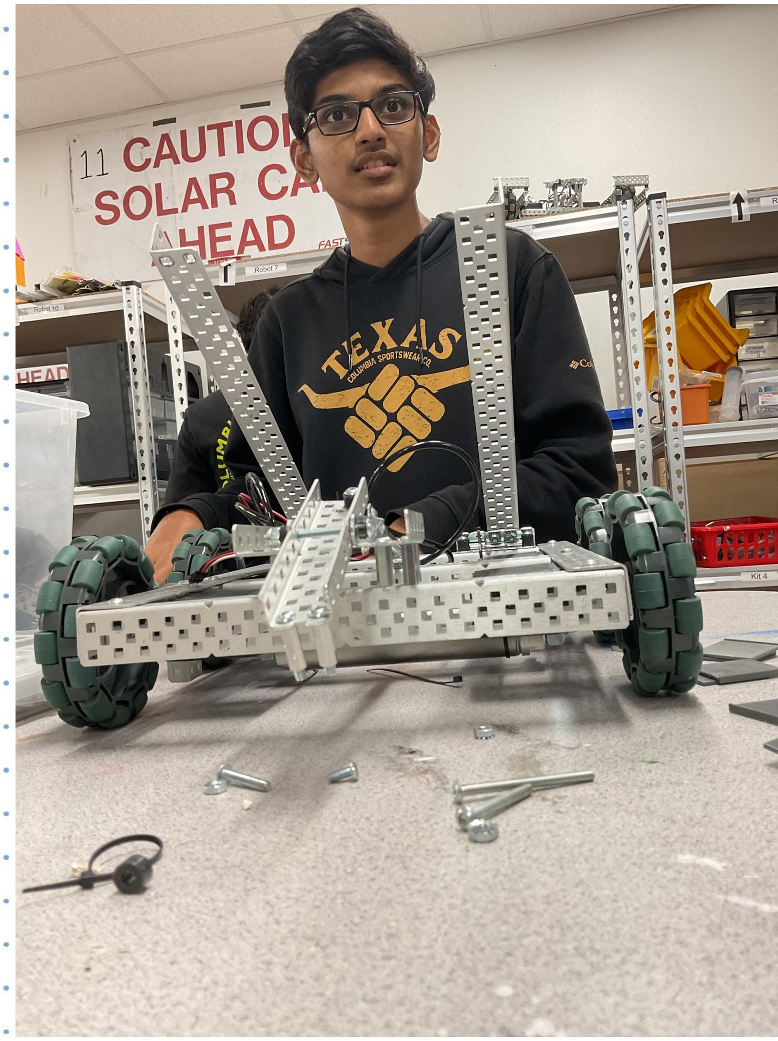


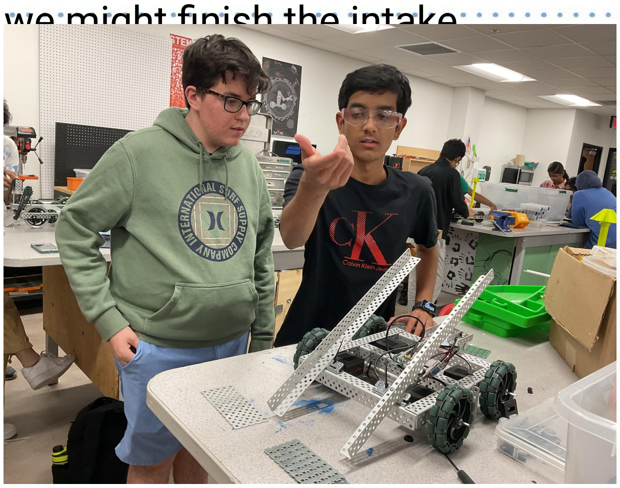


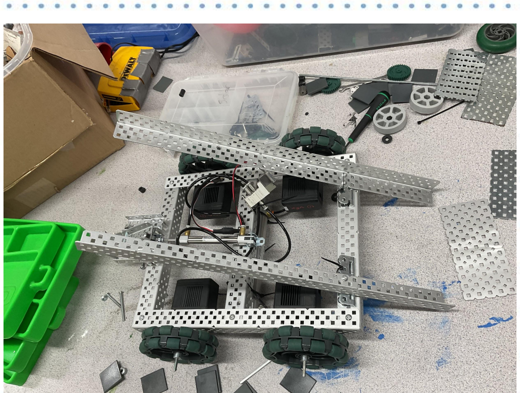


Intake Building

Today we finally got back on the making the intake, we have used 2 hinges to angle and place those 2 long metals that would funnel the ring to the stake, We have measured those to fit the ring nicely. Next we will lay out the tracks and and power it so that we can feed the ring to the robot. This mechanism will be fast and accurate because this is a very important aspect of the robot. We could have gotten more done but 2 of our teammates are basically never here. And Sam always busy helped other team instead of working for our own team. Typical Sam. So next week we might finish the intake.







Here we can see our builders working on the robot.

Project Intake Again?

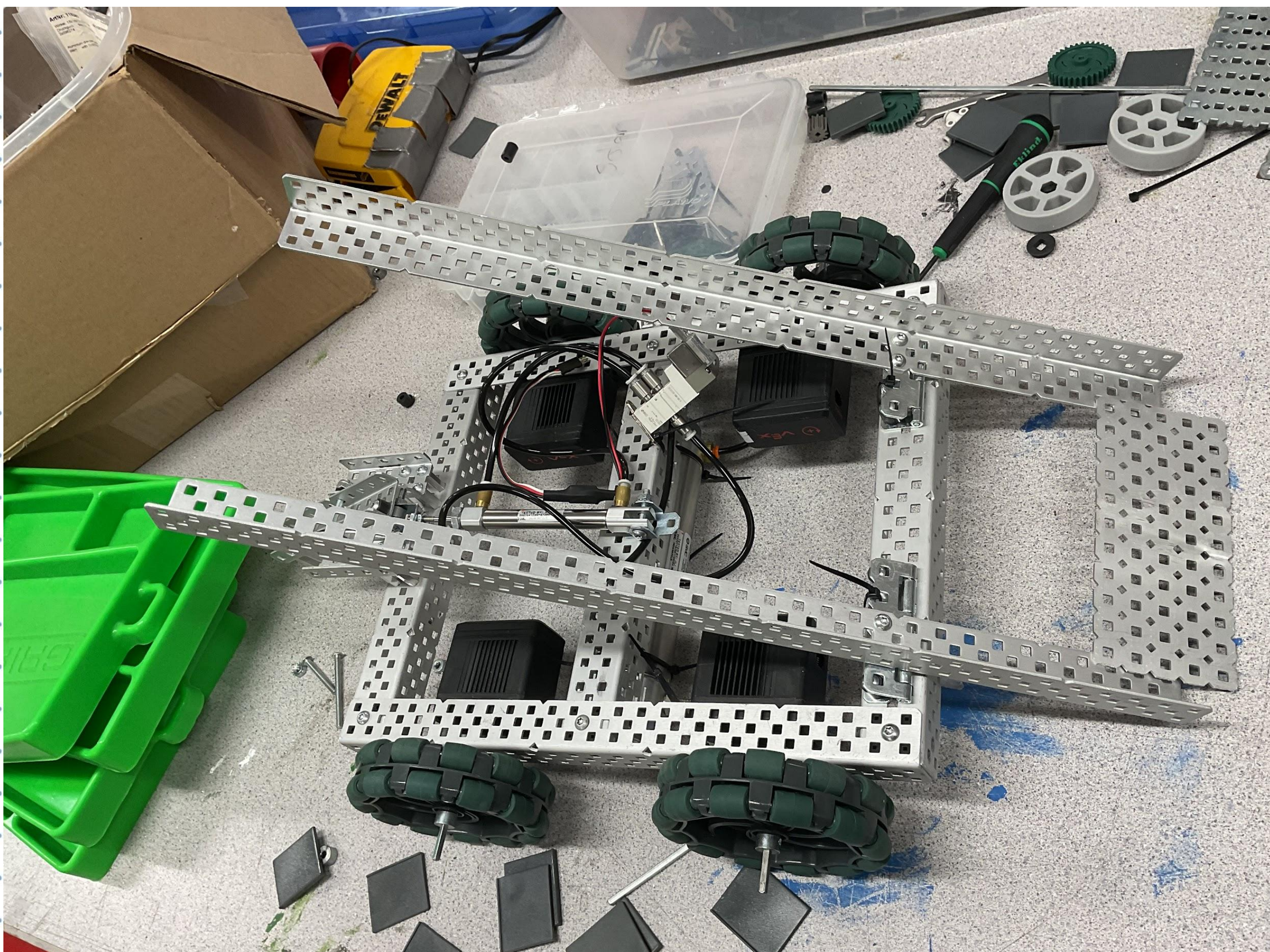
Name Autobots

Date 10/2/2024

In the image below we can clearly see the conveyor belt design. This mechanism is for the ring to get to the stake. We added 2 C channels completely parallel to each other to make sure the robot is equally weight distributed. We also made sure to measure the C channels so that they are exactly one ring apart to make the ring fits the robot and the conveyor belt mechanism that we are about to put in the next step. Anyways we came up with this design after watching some of the best vex robots in the world.

Here are some advantages of this design:

- Smooth and efficient
- Easy to control
- Picking up mechanism



Weekly report

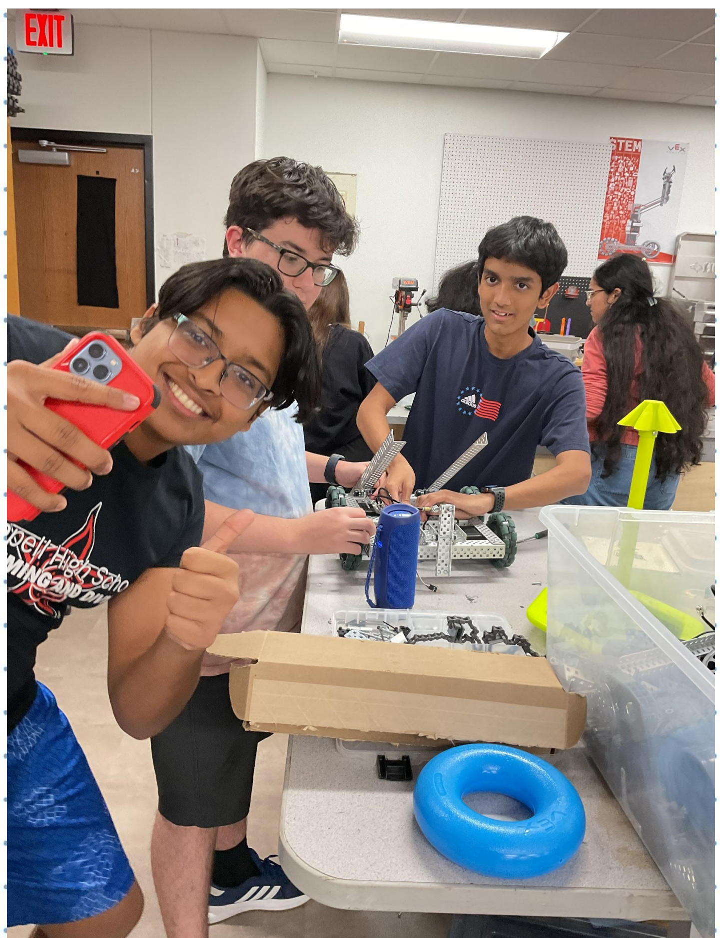
This week, we made significant progress on our robot's intake mechanism. Our focus was on constructing the system that will guide the ring to the stake with precision and efficiency. We utilized two hinges to properly angle and secure the two long metal pieces that act as a funnel, ensuring the ring is positioned correctly for the robot to pick it up. After taking detailed measurements, we confirmed the metal pieces would fit the ring perfectly, and the next step will be laying out the tracks and powering the mechanism to allow for fast and accurate feeding of the ring to the robot. This intake system is a critical part of our robot's overall design, so we are being meticulous in its construction to ensure peak performance.

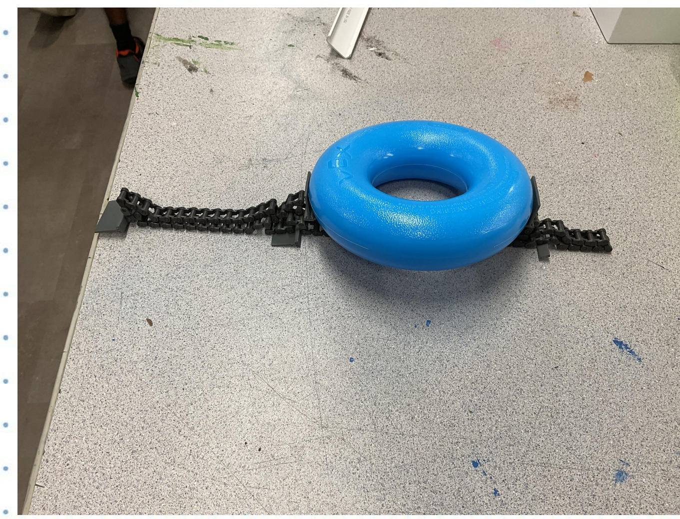
However, progress was slower than expected due to a lack of participation from two team members, who have been frequently absent, and Sam, who spent much of his time assisting other teams instead of working with us. Despite this, we are hopeful that next week we will complete the intake mechanism.

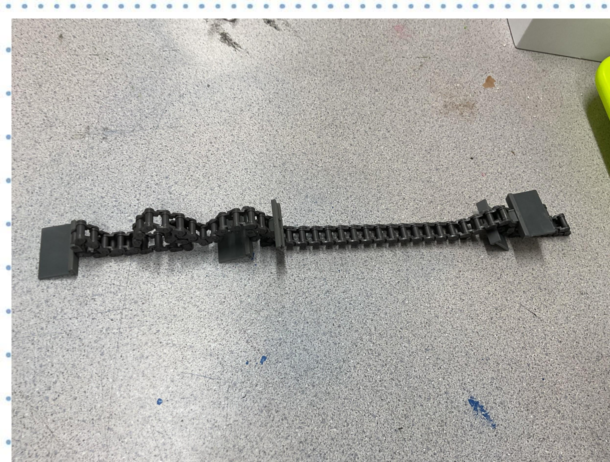
In addition to working on the intake, we conducted stress tests on the hook and motors to assess their performance under load. The hook, already highly responsive, was made even faster and tighter. During testing, we identified the need to refine the stopping position of the hook to ensure the stake is aligned correctly regardless of the angle it is picked up from. Meanwhile, our motors performed exceptionally well, showing that the robot is extremely fast. However, a mishap occurred when Sam zip-tied the brain and dock to the robot, which caused them to fly off when the robot was moving at high speed, forcing us to halt motor testing temporarily. Furthermore, we stress-tested the pneumatic system, which worked well, though we had to refill the tank every two minutes due to heavy use.

While there were some challenges, particularly with testing and team coordination, we are making steady progress toward refining the robot and ensuring all systems are working as intended. Next week, we aim to finalize the intake mechanism and address any remaining issues with the hook and pneumatics.

Today Oct 8 we made some progress. We created the conveyor so that the ring can be propelled upwards by the motors. Below is a picture of that mechanism. We have also tested some of other mechanism. We secured the pneumatics system to the robot instead of using zip ties only, we screwed it down and we still use zip ties. We gotta figure it something with the zip ties because I don't think it is good to zip tie that important of a piece of the robot. Arnav also came back which is a really rare sighting because he is almost never here. Being Arnav he brought the JBL speaker which really motivates us to keep working while enjoying the music if only someone (Arnav) picked good music. We gotta improve Arnav's taste in music just like we are constantly improving our robot to be better than yesterday. Soon we will figure out the conveyor belt thing and ensure that the ring can get to the stake 100% and sits there firmly. Welp that sums up today, we also cannot forget Sam goofing off again.







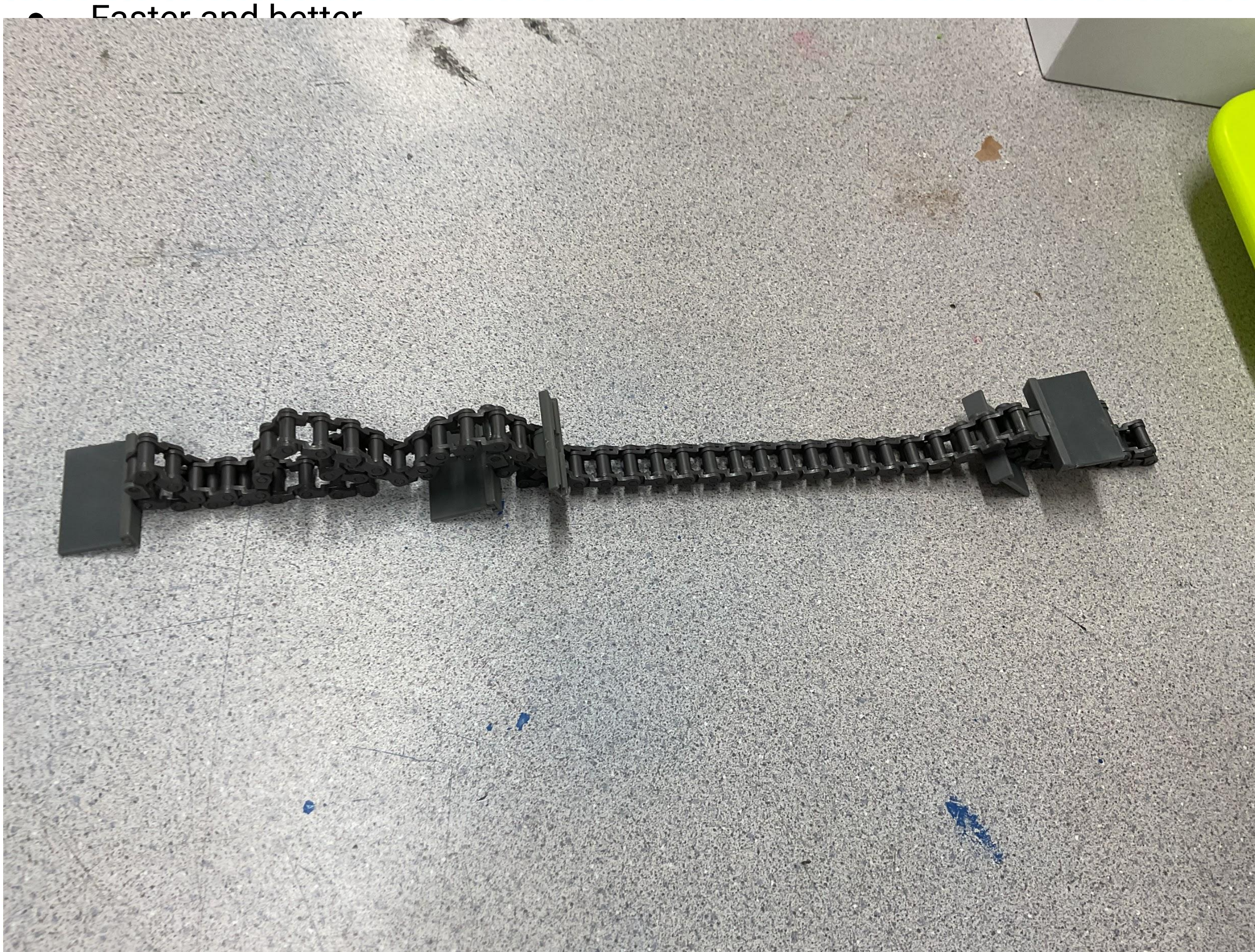
Project Conveyor belt

Name AUTOBOTS Date 10/8/24 Page 26

Here is a rough draft on what the conveyor belt would look like. It's just tracks with rubber flaps spaced perfectly for a ring. Which in this case is spaced apart 7 spaces. Spacing it apart 7 spaces makes it perfect for the ring to fit every time. Without this accurate spacing the ring would only make it to the stake sometimes and would most likely miss the stake multiple time because the speed of the ring is different every time leading to lower accuracy.

Advantages:

- More accurate ring consistency
- Evenly spaced
- Faster and better



Here is an image of the conveyor belt with a ring on it. This is to show how evenly spaced the belt and a rough idea of how it's going to up.

How is it going to work?
- First the intake pushes the ring to the conveyor belt
- Next one of the rubber flaps get a grip on it
- The conveyor belt keeps rotating
- At the end of the conveyor belt the ring will be on the stake
- Ensuring points

WEEKLY REPORT

This week, we made notable progress on multiple fronts, with some setbacks along the way. Early in the week, we focused on creating the conveyor mechanism that allows the ring to be propelled upwards by the motors. This was a significant step in refining our design. Additionally, we secured the pneumatics system to the robot more effectively, moving away from using only zip ties by adding screws for a firmer hold. However, we're still considering better options for securing critical components, as relying on zip ties may not provide the necessary stability for such an important piece.

A notable team moment occurred when Arnav returned, a rare event given his infrequent attendance. As expected, he brought along his JBL speaker, keeping the atmosphere lively with music, though his taste remains a point of contention. Improving Arnav's music selection has become as much of a focus as improving the robot itself!

Towards the end of the week, however, progress slowed significantly due to multiple factors. Several key team members were absent because of leadership committee meetings, and the team left early when Sam decided to take the robot home for the long weekend. Sam has promised to finish the intake system by the end of the weekend, which will hopefully make a substantial difference, as the team has been stalled for a while after completing the drivetrain. Initially, we had a strong start, but after finishing the drivetrain, our momentum decreased, and we've been stuck working on the pneumatics for about two weeks.

Overall, while we've made some good progress, especially on the conveyor and pneumatics system, the team's pace has slowed. We're looking forward to next week when we hope to see significant development, especially with the intake

Getting Back on Track

After a three-week break, we finally returned to working on our robot. It's been a while, and naturally, we lost some momentum, but we're now shifting our focus entirely toward efficiency. The team is pushing to make up for lost time, and everyone is trying their best to stay on task. Sam, in particular, is making an effort to stay focused—cutting down his trips to the other group from a whopping 27 times to just four. That's a massive improvement and definitely a step in the right direction. Aside from getting back into the groove of things, we received some crucial components today, which will play a major role in getting our robot up and running. Among these, we now have the brain, battery, and charger—all essential for powering and controlling the robot. Without these, there wouldn't even be a way to begin programming, so securing these components was a significant milestone. However, along with these necessary parts, we also received something unexpected—a VEX Booster Kit. This kit contained various spare parts, some of which could have been incredibly useful if we had them earlier in the process. Looking at it now, certain components, like extra C-sections, would have helped us build a better chassis from the start. Unfortunately, at this stage, they're not very useful for our current design. Nevertheless, there's always a chance we might find a creative way to integrate some of these spare parts into our build, p

NEW BATTERY

The main task for today was attaching the brain to the robot, as it controls all movement and functions. Proper placement was critical to ensure accessibility while keeping it secure. After some discussion, we found the best spot and successfully mounted it.

Next, we set up the connection between the brain, laptop, and robot, a key step in preparing for programming. Since we've previously worked with the VEX coding platform in robotics class, we're already familiar with the system, which should speed up the process once we start coding. The plan is to begin programming soon, starting with basic motor control and movement.

We also need to handle wiring and cable management, ensuring all motors and sensors connect properly without interfering with moving parts. Additionally, we're still considering whether some gears from the Booster Kit could enhance the design. If they help optimize torque or speed, we might integrate them into the build.

By the end of the session, we had the brain installed, the connection set up, and a solid plan moving forward. With a strong focus on efficiency, we're making steady progress.

Looking Ahead: The Final Push

Our goal is to finish the robot by Thanksgiving, which means staying on schedule with key tasks like:

- Completing wiring and motor connections
- Programming movement and automation
- Testing and refining performance

With the brain installed and programming prep complete, we're on track, but staying disciplined is essential. Every session counts, and we need to keep distractions to a minimum to meet our deadline. Moving forward, we'll continue troubleshooting, optimizing, and making sure we build the best possible version of our robot.

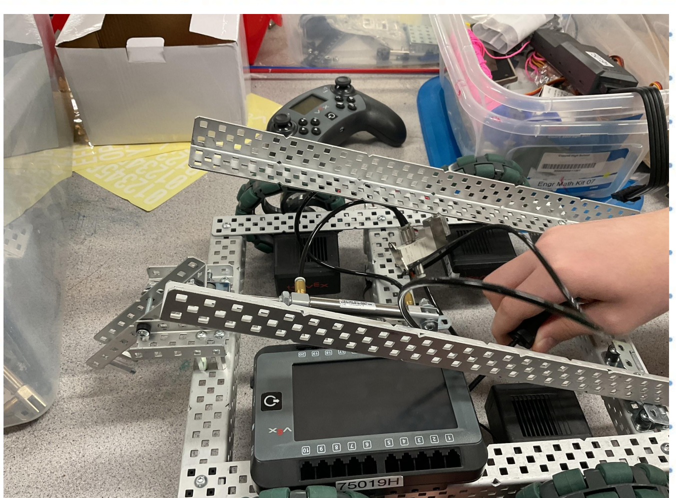
Now that we're fully back in action, we've set a firm goal—to finish the robot by Thanksgiving. This deadline gives us a clear timeframe to work within and ensures that we stay focused on completing all necessary tasks before the break. Meeting this goal will require a well-organized plan, efficient time management, and strong teamwork.

There are still several steps left to complete, including:

- Finalizing the structural build of the robot
- Completing all necessary wiring for power and motor control
- Programming movement and automation functions
- Testing and refining the robot's performance

Since we've already started making significant progress with the brain installation and programming setup, we're on track to meet our goal—but we'll need to stay disciplined. That means keeping distractions to a minimum, ensuring that all parts are used effectively, and making sure that every team member contributes productively.

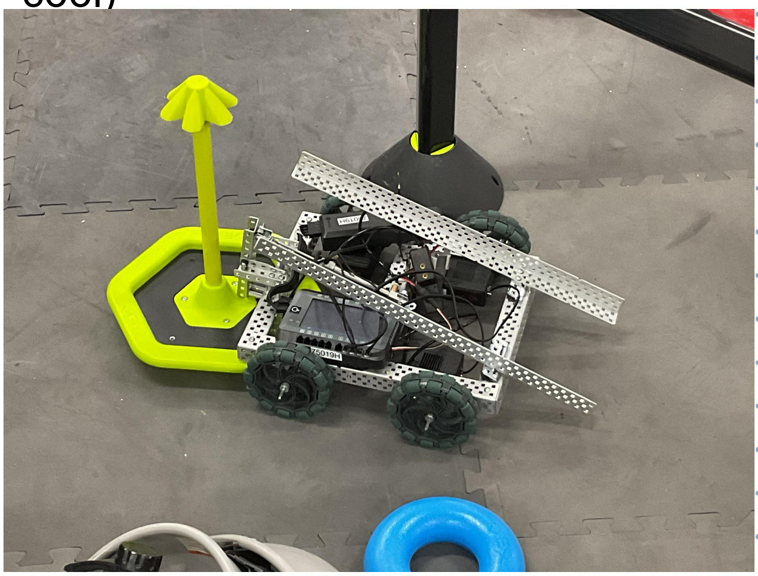
As we push forward, we'll continue documenting our progress, troubleshooting any issues that arise, and making adjustments along the way. Now that we're back into the swing of things, it's time to make every session count!



Project Booster equipment

Name AUTOBOTS Date 9/6/24

We connected the robot with the brain, radio and battery. We figured out how to control the robot using a controller, Neerav was testing it today and he had some with it. But I feel like our wiring was not done good, I feel like we have to make our wiring systems more organized but other than that the robot function well, charges fast and the pneumatics work with the click of a button on the controller. Our booster kits still pretty useless except for the gear potentially. Also (Sai is cool)



In the image on the left we can see the robot hooking onto the stake. This mechanism allows us to take the stake with our robot to score the rings.

Here we can see our test driver, Neerav Puppala has been building and testing our robot. Today he connected the brain, radio and controller to The robot. Wanna know how we connected it there, ? We ZIP TIED IT, I bet you didn't see that coming that's right at this rate we will make it to Vex world.

We connected the robot with the brain, radio, and battery, marking another important step in our progress. After setting everything up, we figured out how to control the robot using a controller, allowing us to test its movement and responsiveness. Neerav took charge of testing today, driving the robot around and getting a feel for the controls. While everything functioned well—the robot responded smoothly, charged quickly, and the pneumatics system worked flawlessly with the press of a button—I couldn't help but notice that our wiring could use some serious improvement. Right now, it feels somewhat messy and unorganized, which might cause issues down the line. A well-managed wiring system is essential to avoid potential disconnections or interference, so reorganizing it should be a priority in our next work session.

As for the VEX Booster Kit, it remains mostly useless at this point. While we originally thought some of the parts might come in handy, we haven't really found a place for most of them, except for a gear that might still have potential use. Meanwhile, Neerav continued working on both the building and testing phases, ensuring all key components were securely in place and fully functional. The most interesting part of the day was how we decided to attach the brain, radio, and controller to the robot. Instead of going with a more traditional mounting method, we opted for a quick and effective solution—zip ties. That's right, sometimes simplicity wins, and zip ties got the job done faster than anything else. It might not be the most conventional approach, but it's working for now, and it's all about making steady progress toward our goal.

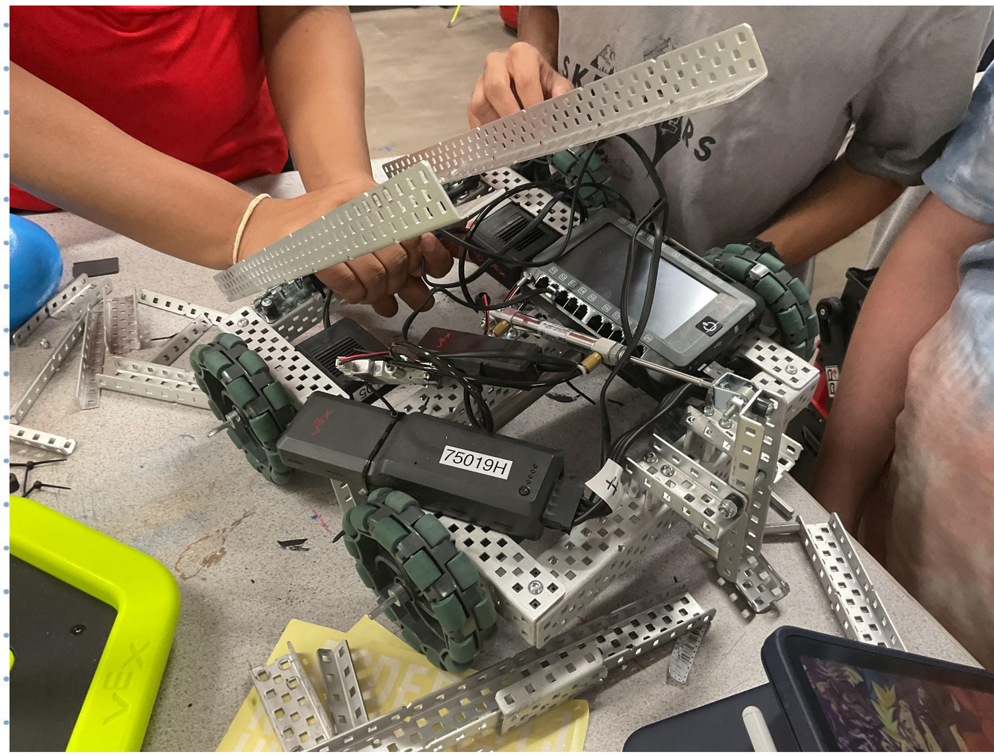
With each session, we're getting closer to refining the robot and improving its performance. While there's still work to do, especially in organizing our wiring, today was a major step forward. At this rate, if we keep up the momentum, we might just make it to VEX Worlds. Also, Sai is cool—just in case anyone needed a reminder.

WEEKLY REPORT

We had an awesome week at vex robotics. We got back into the swing of things pretty fast even after a 3 week gap between the last practice we had. We quickly started building our robot, we picked up where we left off. This week we got access to some brand new parts for the robot like the brain, battery, controller, radio and a charger. These new parts drastically changed our robot for the better. Now we can finally control and drive our robot for real, we even tested it out and it drove fast and we had a small battle with a different robot, and it turns out that our small chassis robot can produce more torque than a wide chassis robot, this will give us a tactical advantage during the actual battle. And also we have made some big progress this week by adding the brain, radio, battery. And we connect everything together using zip ties for now and we will swap them out for screws later on. We also coded the controller to engage and disengage the pneumatic system that hooks onto the stake. We have more to see next week, as we will be trying to finish the conveyor belt system and make sure the ring can go to the stake comfortably.

Conveyor Belt Building

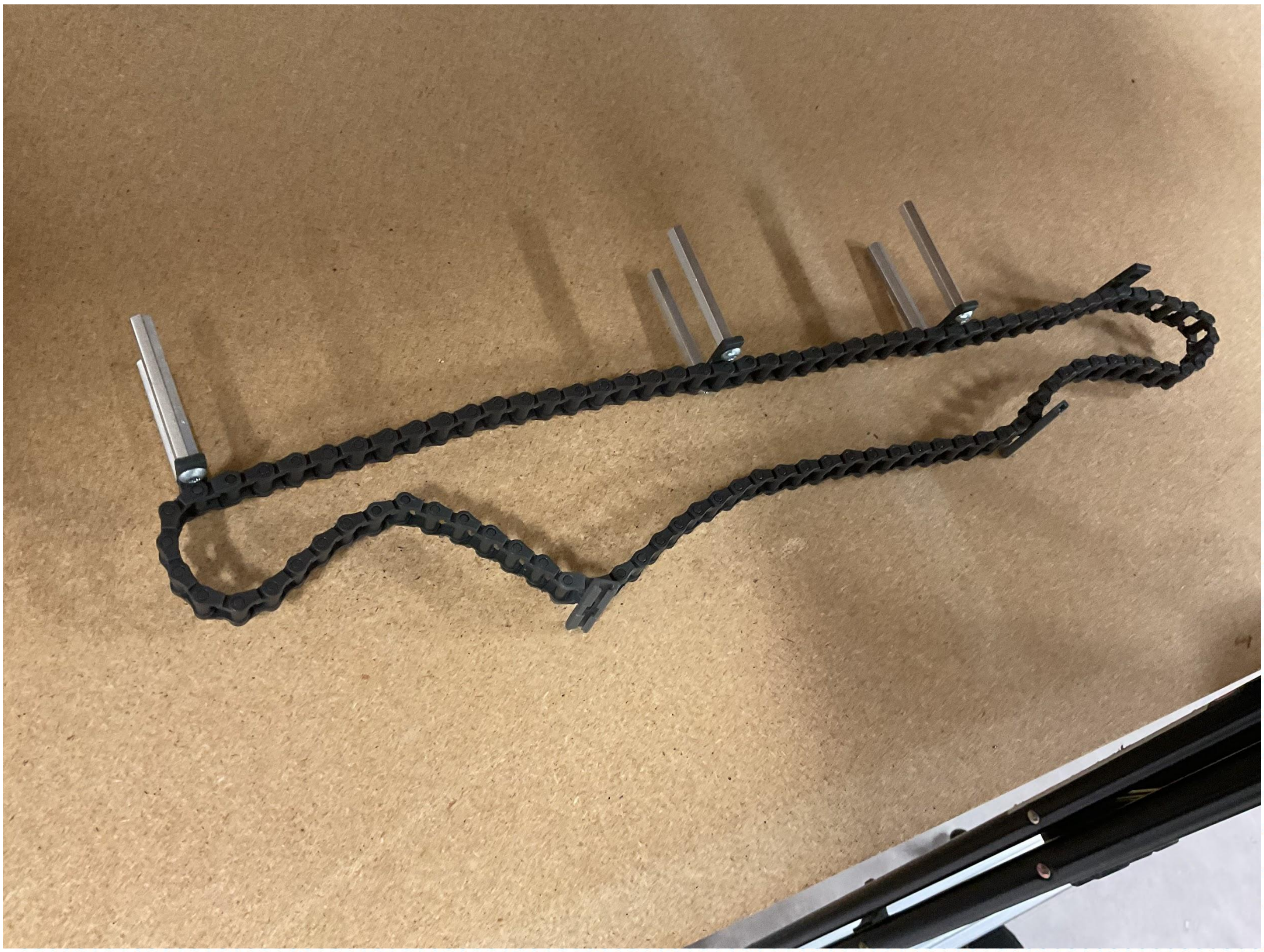
Today we did not get much done, all we did was some 10 minute work in like 2 hours because all we made is a conveyor belt system, we just got started on it. And we can see ourselves potentially attach to it to the robot tomorrow. Today Sam was obviously more focused on other groups instead of building our own robot, you know typical Sam stuff. But I did manage to get a rare sighting of everyone working on the robot trying to make some progress



Project Conveyor belt

Name AUTOBOTS Date 9/17/24

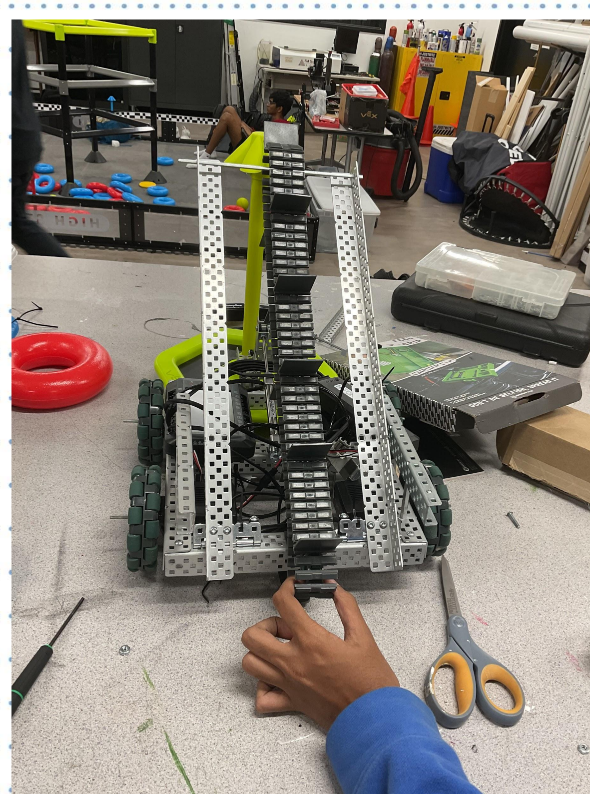
In this image below we can see that we have changed the conveyor belt design because the previous belt wasn't very consistent in getting rings as the ring kept slipping out of the conveyor belt. So this new will use the hook mechanism where we slightly hook onto the ring to ensure that it makes it onto the stake. We plan on adding cut out polycarbonate. We are cut like a triangle out of the polycarbonate and add some screw holes to it using a drill. Then we will add those polycarbonate onto hooks using screws. This will ensure that the ring will get hooked by the hook system to be taken to the stake.

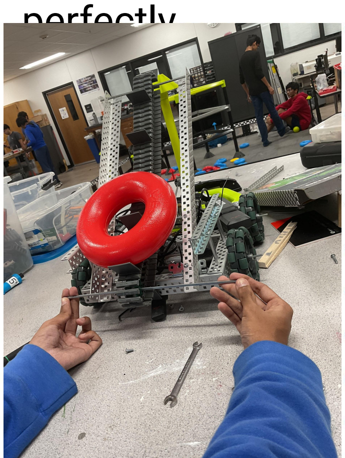


Today we made our conveyor belt system, this system is to ensure that the rings can get to the stake easily. The rings will climb up the conveyor belt and move onto the stake because the belt will be moving at the perfect velocity. To make the belt we used tracks, rubber flaps, and 2 gear guiding the track. The rubber flaps were measured perfectly. But we are not sure about the rubber flap technique as the flaps are way to bendy and the ring slips out too much for the belt to be reliable during the drive.

Firstly I made a conveyor belt for the intake, each flap being perfectly 8 treads apart allowing for the ring to fit perfectly.

Here we can see the conveyor belt attached to the robot although it's not fixed in yet because we might have to make some minor changes to ensure that the ring can get to the stake perfectly





This is a rough demonstration of how the intake system could work. We plan on finishing this system in the next week including the motors and the gear ratios. Working at this rate will ensure that we have a finished prototype of our robot by thanksgiving

Project Conveyor belt

Name Autobots Date 9/18/24

Today, we built our conveyor belt system, designed to efficiently transport rings onto the stake. The belt moves at a precise velocity, ensuring the rings smoothly climb up and transfer onto the stake. To construct it, we used tracks, rubber flaps, and two guiding gears to keep the system aligned. The rubber flaps were carefully measured to ensure proper spacing, but we're still uncertain about this method. The flaps seem too bendy, causing the rings to slip too often, making the system unreliable during movement. We may need to reconsider this approach to improve consistency.

For the intake, we designed the conveyor belt with flaps positioned exactly eight treads apart, allowing the rings to fit perfectly between them. This precise spacing was meant to optimize grip and movement, but with the current issues, adjustments may be necessary. While the conveyor belt is attached to the robot, it's not fully secured yet, as we anticipate making some refinements to guarantee smooth ring transfer to the stake. Minor modifications might include adjusting the flap material or tweaking the belt's alignment.

We also worked on a rough demonstration of how the intake system could function once fully implemented. The next step is to integrate motors and gear ratios, which we plan to complete by next week. If we maintain this pace, we'll have a fully operational pr[illegible] Thanksgiving, keeping us on trac[illegible]
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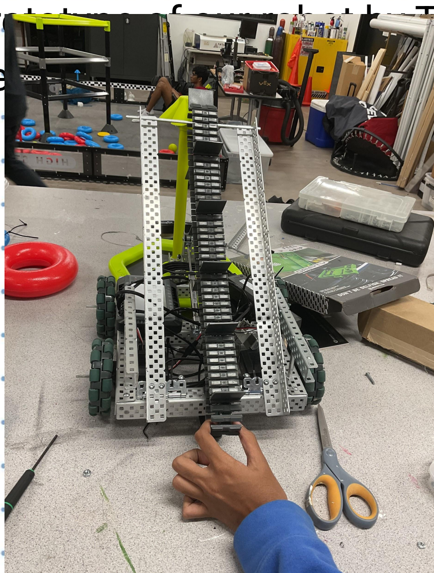
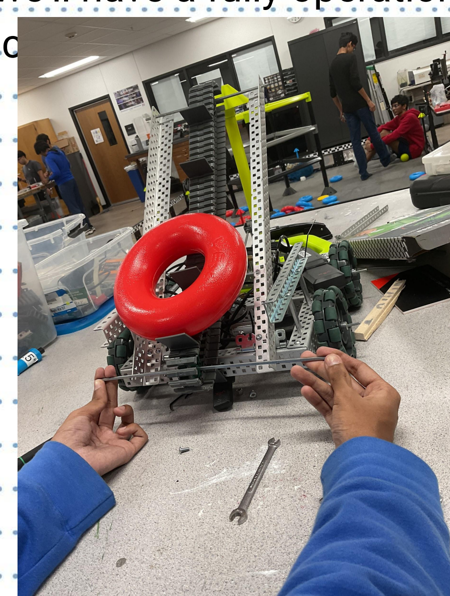




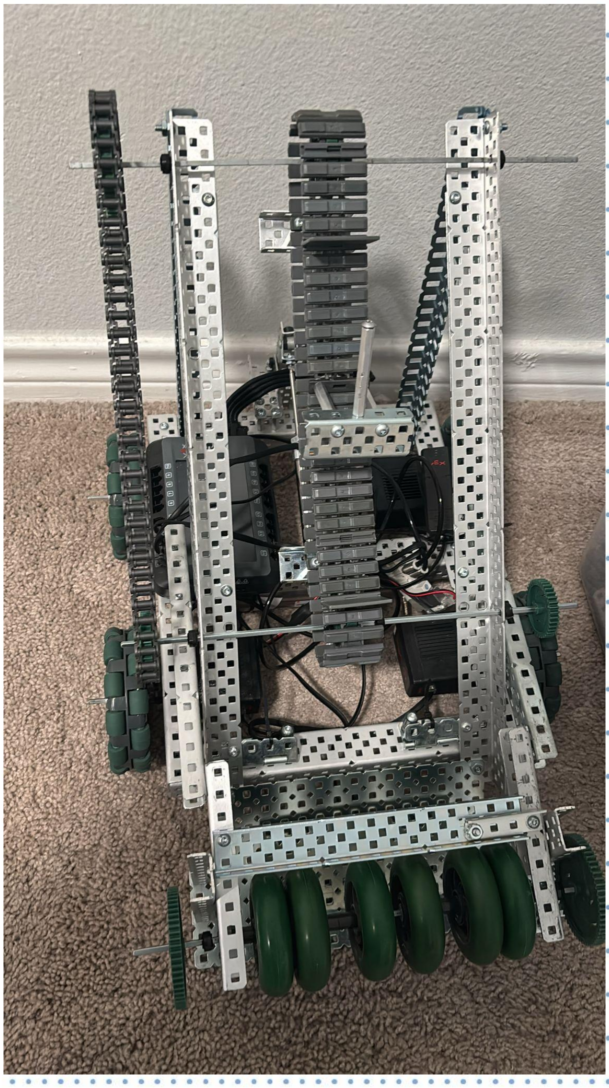
Project Conveyor belt

Name Autobots Date 9/18/24

WEEKLY REPORT

This week in vex, we saw some really good progress on the robot. On tuesday we did not see anything crazy, not much progress on the robot except for some minor adjustments. Sam was just goofing off, helping around other teams more than us. But on Wednesday it is a whole different story because we had ⅗ people technically 3/6 but the girl got kicked out for not helping us in building the robot because she is never here. I mean I barely saw her, the last time I saw except today was probably like weeks ago in vex . But today we basically completed the rough draft for the conveyor belt, and will probably finish the final draft next week. This will give us an advantage in terms of time to catch up with the juniors and give us a chance to compete.

This weekend, Shivas decided to take the robot home to work on it, and the progress he made was impressive. With extra time and focus, he was able to dive deep into improving the robot, making significant strides toward completing the build. He primarily focused on finalizing the intake system, which is one of the key components for picking up and transporting the rings. As of now, the intake system is nearly finished, and it's functioning well. The primary task left is to connect the conveyor belt to the right gear, which will ensure the belt operates at the correct speed and efficiency. This final connection will be critical to making the entire intake system work smoothly. Additionally, two motors need to be added to provide the necessary power to drive the system, which will allow the rings to move through the intake and onto the conveyor belt.



In the image on the left, we can see the full robot, now equipped with the finished conveyor belt system. The design is coming together nicely, showcasing all the hard work and effort put into its construction so far. A key modification that stands out is the iron hook we attached to the conveyor belt. Originally, we planned to use polycarbonate for this part, but due to some difficulties in sourcing the material, we had to make an adjustment and use iron instead. We're fully aware that polycarbonate is a better fit for the final build due to its lightweight and durable properties, so as soon as we manage to find polycarbonate, we'll immediately replace the iron hook. This change will improve both the efficiency and aesthetics of the design, as polycarbonate is less likely to cause wear and tear over time. Overall, the project is progressing well, and we're excited to see it take shape even more as we continue working on it

The intake system operates by pushing the rings into position using wheels. However, while this method works, we've realized that flex wheels would be a better option. Flex wheels are specifically designed to provide better grip and efficiency, making them ideal for this kind of system. They can easily grab and push the rings into the correct position, ensuring smoother operation and reducing the chances of slippage or issues during movement. By replacing the current wheels with flex wheels, we expect to improve the overall performance of the intake system. The system is already performing well, with the conveyor belt effectively moving the rings onto the stake, but we're confident that the change to flex wheels will make it even more reliable.

With the new wheels, the intake process will be more consistent, and we'll have a much higher level of control over how the rings are picked up and moved through the robot. This adjustment will help ensure that the system can handle the rings efficiently, especially during rapid movements or when the robot is performing tasks at high speed.

This is the top of the intake system, where we've designed the components to work efficiently together. On the side, a track is used to rotate the shaft, and it's connected to a gear that drives the rotation. The gear, when powered by the motor, ensures smooth operation of the intake system, helping move the rings effectively.

The motor is placed below the intake, carefully positioned to allow for even weight distribution across the robot. This helps maintain the robot's stability and prevents it from tipping or becoming unbalanced during operation. By placing the motor in this location, we ensure that the weight is spread out evenly, supporting smooth and reliable performance.

This setup, with the track, gear, shaft, and motor in alignment, ensures that the intake system will function effectively while keeping the robot stable.

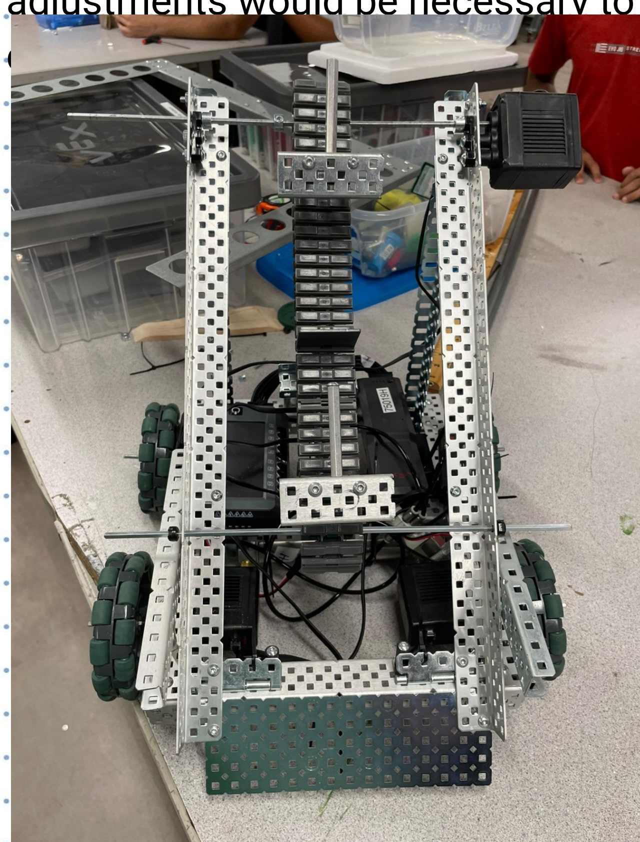
Now that the intake system is nearly complete, the next steps are relatively straightforward but crucial to ensure everything runs smoothly. The immediate task is to connect the conveyor belt to the right gear. This is important because the gear will regulate the movement of the conveyor belt, ensuring it operates at the correct speed and in the right direction to transport the rings. After that, we need to add two motors to power the entire intake system. These motors will provide the necessary force to drive the wheels, conveyor belt, and other mechanisms involved in picking up and moving the rings. Once the motors are connected and everything is properly aligned, the intake system will be fully operational, and we can begin testing its performance.

Once the system is up and running, the next phase will be to run a series of tests to identify any potential issues, such as slippage, motor performance, or alignment problems. Testing is an essential part of the process as it will allow us to catch any bugs early and make adjustments to improve efficiency. If needed, we can tweak the gear ratios, motor speeds, or any other component to ensure that the intake system works as smoothly as possible. Once everything is functioning correctly, we should start to see the system working as intended, with the rings being picked up, transported by the conveyor belt, and smoothly transferred onto the stake.

Maintaining the momentum we've built over the past few weeks is key to finishing the robot on time. If we keep progressing at this pace, we're well on track to meet our goal of having a fully functioning prototype by Thanksgiving. Shivas' hard work this weekend has brought us significantly closer to completing the intake system, and once that's fully finished, we'll be able to shift our focus to other important areas of the robot. These areas include refining the drive system, integrating sensors, and fine-tuning the robot's overall functionality. With the intake system nearly complete, we're in a strong position to finish the rest of the robot in time for Thanksgiving. If we continue to stay focused and make steady progress, the prototype will be ready for testing and further improvements by the end of the month.

After conducting a thorough analysis of our robot, we discovered that it was slightly over the competition's maximum length limit by approximately 3 cm. Although this may seem like a small difference, it was enough to disqualify the robot from meeting official regulations, making it necessary for us to find a way to shorten it. However, this process was not as simple as just cutting or removing parts because every component of the robot plays a critical role in its functionality. One of the biggest concerns was that modifying the length could negatively impact the intake system, which is responsible for collecting and transporting game objects.

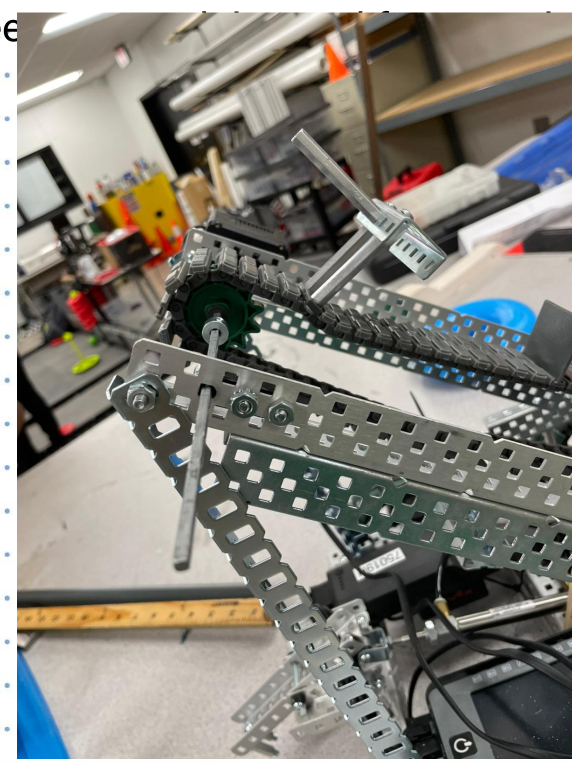
To address this issue, we decided to begin by testing whether removing the wheels at the front of the robot would help us meet the required length. By taking them off, we were able to slightly reduce the total size of the robot. However, this change introduced new challenges, such as affecting the robot's overall balance and maneuverability. While this was a step in the right direction, we knew that additional adjustments would be necessary to ensure that the robot remained both [illegible]al.



Removed wheels and added motor for better grip on the ring. Easier access to power

To further improve our robot's design and reduce its length, we implemented structural modifications that would allow us to maintain both balance and efficiency. Since removing the wheels alone was not enough to fully meet the size requirements, we also adjusted the incline angle at the front of the robot. This adjustment made the robot more compact while still allowing it to function as intended. However, modifying the incline was a delicate process, as we had to carefully calculate the best angle to maintain stability and intake efficiency.

After making these adjustments, we conducted a series of tests to evaluate how the robot performed without the front wheels. We observed that while the length had improved, the steeper incline slightly altered the way the intake system functioned. This meant that we would need to further fine-tune the design in future build sessions. Despite these new challenges, the modifications marked significant progress toward making the robot competition-ready. Over the next few sessions, we plan to fine-tune the incline and test different configurations to achieve the best possible balance betwee y.



Removed gear to fit motor and finding the perfect gear to fit there, this helps us move the axle faster unlocking more potential from the motor itselves

One of the most important modifications we made during this session was the installation of a motor on the conveyor belt. The conveyor belt plays a vital role in the intake system, as it is responsible for moving objects efficiently through the robot. Without a properly functioning conveyor, the robot would struggle to collect game pieces quickly, putting it at a competitive disadvantage. Given this, we decided to add a motor at the top of the conveyor belt to enhance its performance.

While the motor installation process was a step forward, the conveyor belt is not yet fully operational. We conducted some preliminary tests using a ring to evaluate how well the system functioned with the new motor. These tests showed promising results, but there were still a few issues that needed to be resolved. For example, we noticed that the belt's movement was not as smooth as we expected, and some further adjustments would be required to ensure that it operated seamlessly. Over the next few sessions, we will focus on troubleshooting the conveyor system, making improvements where necessary, and ensuring that the motor provides enough power t

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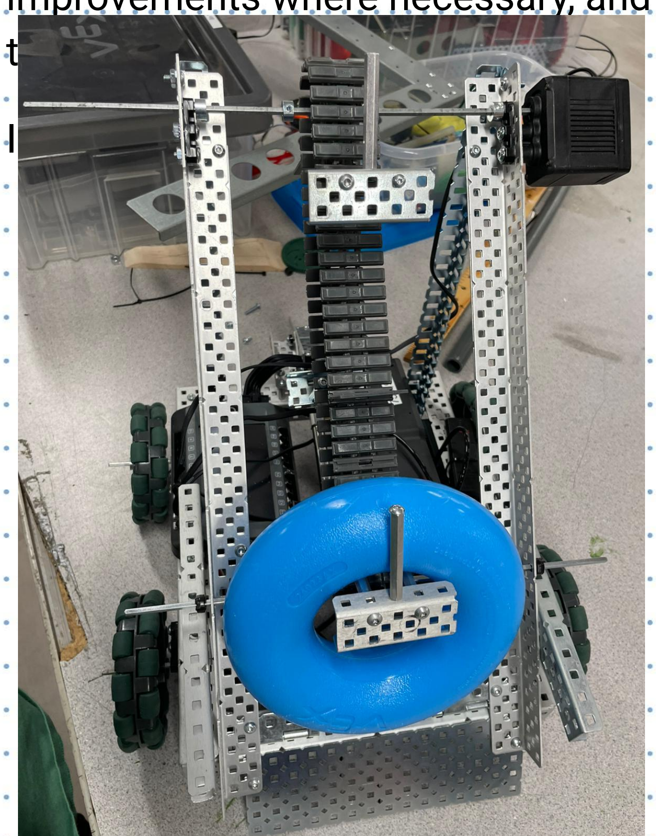


Ring testing up the conveyor belt. The conveyor belt successfully gets the ring up to the stake but we do have to make some changes to the belt speed to ensure 100% accuracy.

Project Rules and regulations

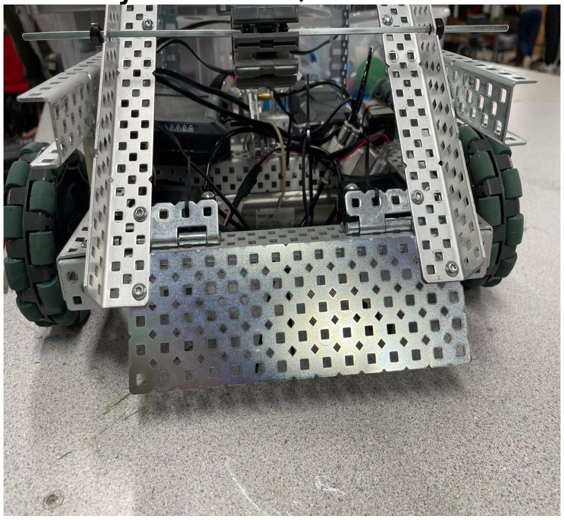
Name Autobots Date 11/19/24

After installing the motor on the conveyor belt, we realized that some adjustments were needed to optimize its performance. Specifically, we had to remove an old gear that was not fitting properly and test multiple new gears to find the best match for the motor. This process was essential because the efficiency of the conveyor belt depends on having the right gear to provide the necessary power and speed. We experimented with several gear options, analyzing how each one affected the movement and responsiveness of the conveyor system.

In addition to finalizing the gear adjustments, we have outlined several key next steps to ensure that our robot is fully prepared for competition. These include:

1. Completing the intake system while ensuring the robot remains within the competition's size limitations.
2. Further refining the conveyor belt functionality to make it smoother and more efficient in handling objects.
3. Conducting thorough testing and troubleshooting to identify and fix any remaining issues.

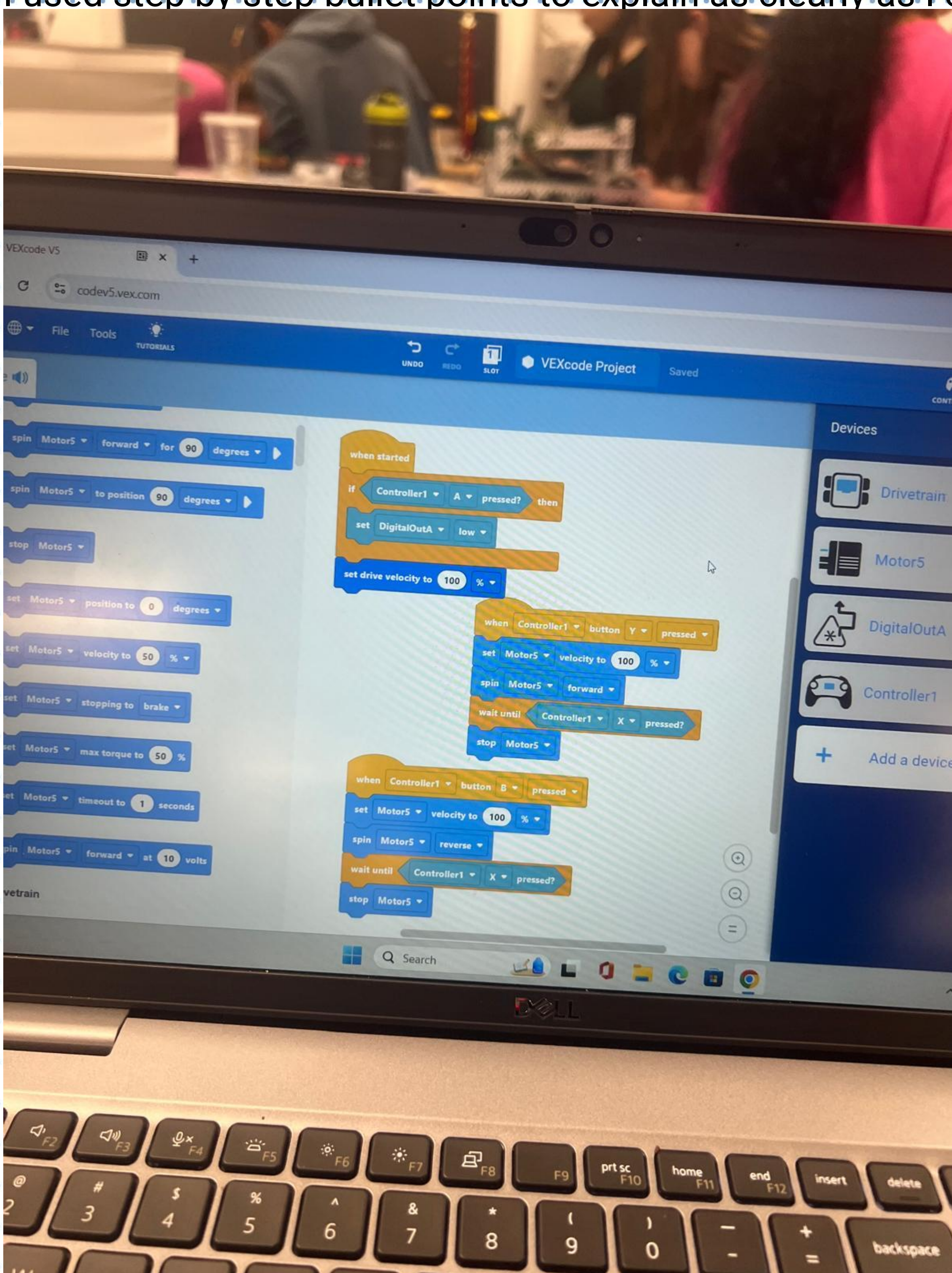
While we have made significant progress in modifying and optimizing our robot, there is still work to be done before it reaches its full potential. We are confident that with additional adjustments, we will have a fully functional, competition-ready robot in the comin



Changes to the front: removed wheels, and made incline stepper.

Coding

Today we were more focused on the coding aspect of the robot. I was not there but the Arnav was coding the robot to obey the controller, apprantely he tested it and ot works flawlessly.. Next we focused on finishing the intake, which we did not finish. We plan on taking the robot home for thanksgiving and finishing it over the big break because we would have plenty of time to finish up stuff. I have explained what this code does in the next slide. I used step by step bullet points to explain as clearly as I could



When started (Yellow Block)

- This block triggers the execution of the program when the robot is turned on.

Set Drivetrain to (X, Y) mm/sec

- This sets the drivetrain's speed to a specific value, controlling how fast the robot moves.

Wait until Controller1 A is pressed

- The program pauses execution until the "A" button on the controller is pressed.

Drive forward (X) mm

- Once the "A" button is pressed, the robot moves forward by a specified distance in millimeters.

If Controller1 L1 is pressed

- Checks whether the L1 button on the controller is being pressed.

Inside the "If" condition (When L1 is pressed)

- Spin Motor1 forward at 50% speed
    - This command makes Motor1 rotate forward at half speed.
- Else (if L1 is NOT pressed)
    - Stop Motor1
    - If the button is released, Motor1 stops spinning.
    - d, Motor2 stops spinning.

CONTINUED ON NEXT SLIDE

If Controller L1 R1 is pressed

- Checks if the R1 button on the controller is pressed.

Inside the "If" condition (When R1 is pressed)

- Spin Motor2 forward at 50% speed
  - This makes Motor2 rotate forward at half speed.
- Else (if R1 is NOT pressed)
  - Stop Motor2
  - If the button is released, Motor2 stops spinning.

Summary of What This Code Does:

- The robot waits for the user to press "A" before moving forward.
- If L1 is pressed, Motor1 spins forward at 50% speed; if released, it stops.
- If R1 is pressed, Motor2 spins forward at 50% speed; if released, it stops.

This setup allows the user to control the robot's motors using a VEX V5 Controller, with the drivetrain moving forward after a button press and motors being manually controlled with L1 and R1.

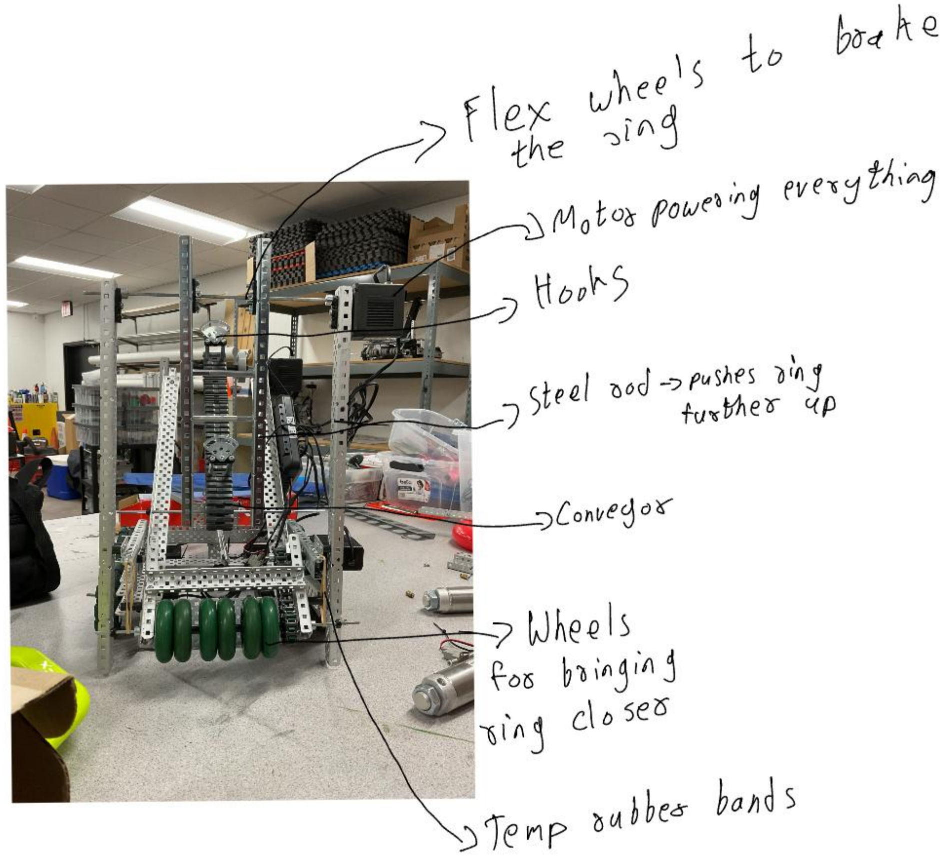
WEEKLY REPORT

This week, we focused on addressing the robot's length, which exceeded the maximum limit by 3 cm, posing a challenge for the intake system. To mitigate this, we temporarily removed the wheels, which helped reduce the length slightly. Additionally, we made progress on the conveyor belt by adding a motor to the top, which is almost functional and shows promise for further progress. Coding efforts were led by Arnav, who successfully programmed the robot to respond to the controller, marking a significant milestone. Although we couldn't finish the intake system, we plan to refine and finalize it over Thanksgiving break when we’ll have more time to work on the robot.

Thanksgiving Break

THANKSGIVING BREAK

INTAKE CHANGES



Firstly on the bottom we added wheels to bring the ring closer to the conveyor belt which marks the beginning of the conveyor belt system. Next we have the actual conveyor belt with hooks placed perfectly after some calculation to ensure the ring has the perfect amount of space to travel up the conveyor belt. We also have an arm mechanism that will constantly spin to push the ring further up the conveyor belt. Lastly we have the steel brake at the end that will slow the ring down to ensure that it will go onto the stake and not overshoot it. This is very important for the robot.

Project Intake changes

Name Autobots Date 9/24/24

1. Bottom Wheels for Initial Ring Pickup

The first critical part of our conveyor system is the bottom wheel mechanism, which plays a fundamental role in guiding the rings into the intake. Without a proper way to control the initial pickup, the rings could enter the conveyor system at odd angles or fail to align correctly, causing inconsistencies in performance. To address this issue, we added strategically placed wheels at the base of the intake. These wheels serve the important function of bringing the ring closer to the conveyor belt, ensuring it makes proper contact before progressing further. We carefully selected the wheel size, material, and positioning to provide just the right amount of force—too little pressure and the ring wouldn't be pulled in effectively, while too much force could cause unnecessary resistance. Through extensive testing, we determined the ideal configuration that allows rings to be gently but firmly guided into the system without disrupting their stability. This small but crucial adjustment marked the beginning of a much more efficient conveyor belt system, setting the foundation for reliable ring transport.

2. Conveyor Belt with Precision-Placed Hooks

Once the rings are successfully guided into the intake area, they transition onto the main conveyor belt, which serves as the primary transport system for moving rings upward. The conveyor belt is designed to function smoothly and efficiently, ensuring that each ring is carried from the bottom of the intake to the final scoring area without disruptions. One of the biggest challenges we faced in designing this component was determining the best way to keep the rings securely in place while they traveled up the belt. If the rings were not properly secured, they could slide out of position, causing jams or inconsistent performance. To solve this, we introduced a series of hooks that are carefully placed along the conveyor belt at precisely measured intervals. These hooks act as guides, ensuring that the rings remain stable while moving up the belt. Calculating the correct spacing for these hooks was essential—too much space would allow the rings to shift unpredictably, while too little space could cause unnecessary friction and slow down the system. After multiple rounds of trial and error, we found the perfect placement that allows the rings to travel upward with maximum efficiency, ensuring that they maintain proper alignment throughout the process.

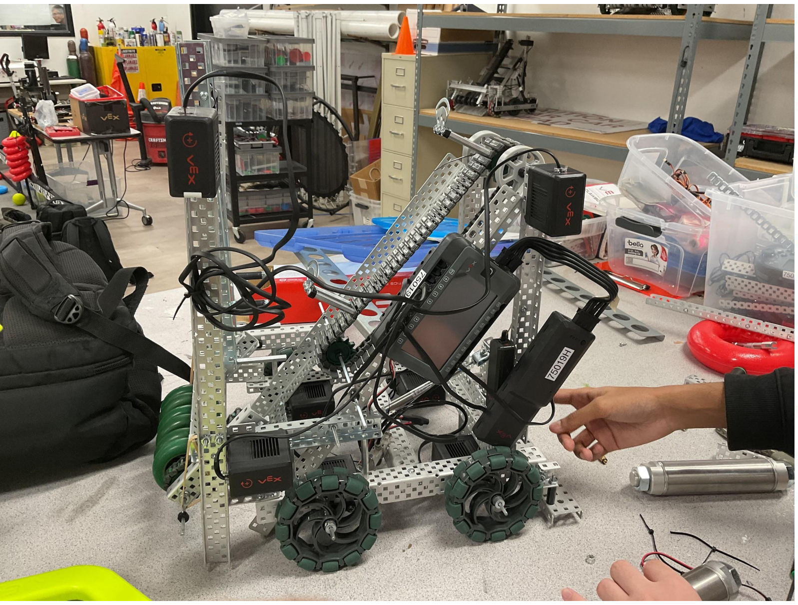
3. Arm Mechanism for Additional Ring Support

Although the conveyor belt and hooks effectively transport the rings, we identified another potential issue during testing—inconsistent movement due to lack of sustained momentum. While the conveyor belt itself provides an upward force, we noticed that rings occasionally slowed down or got stuck mid-way, especially when multiple rings entered the system in quick succession. To counteract this, we incorporated an additional spinning arm mechanism that constantly rotates, pushing the rings further up the conveyor belt. This arm ensures that each ring receives a consistent push, maintaining steady movement throughout the transport process. The speed of this arm had to be carefully adjusted—if it spun too fast, it could disrupt the natural flow of the conveyor system, while too slow of a rotation wouldn't provide enough assistance. After multiple speed tests and fine-tuning, we achieved an optimal rotation rate that helps keep the rings moving efficiently without interfering with the overall operation. This mechanism significantly improves the reliability and consistency of our system, ensuring that rings do not get stuck or fall out of alignment during their journey upward.

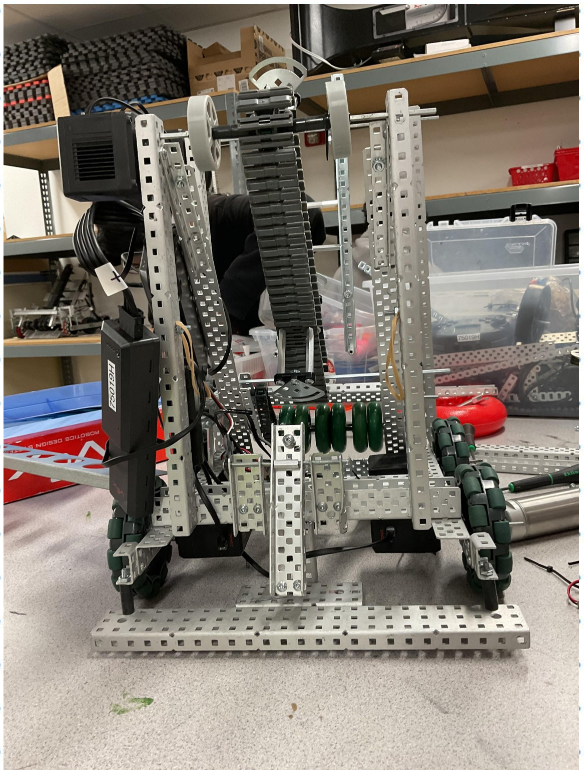
4. Steel Brake for Controlled Release

The final and perhaps most critical component of our conveyor system is the steel brake at the end of the belt, which plays an essential role in controlling the release of the rings. Without a braking mechanism, rings could gain too much momentum and overshoot their intended target, making scoring highly inconsistent. The primary purpose of this steel brake is to slow down the ring just before it exits the conveyor belt, allowing it to land precisely on the stake rather than flying past it. We experimented with different braking materials and configurations before settling on steel, as it provided the perfect balance of resistance and durability. The brake applies just enough friction to decelerate the ring smoothly without stopping it entirely. This is a crucial aspect of our robot's performance, as it ensures accuracy in scoring by preventing the rings from bouncing off unpredictably. A poorly controlled release could mean the difference between scoring and missing points in competition, so we spent a significant amount of time fine-tuning this component to achieve maximum precision and reliability.

THANKSGIVING BREAK



During the break we changed the location of the brain, we moved it from the bottom of the robot to the side of the robot to save much needed space for the intake. The led to a bunch of rewiring. We even changed the location of the battery.



We also added a backplate so that the stake will be better hooked on to the robot and handle the sharp turns, braking and acceleration.

Project BREAK WORK

Name AUTOBOTS Date 9/27/24

THANKSGIVING BREAK

We also added a backplate so that the stake will be better hooked on to the robot and handle the sharp turns, braking and Sure! Here's a much more detailed version of your sentence, expanding on why the backplate was added, how it improves performance, and what challenges it solves.

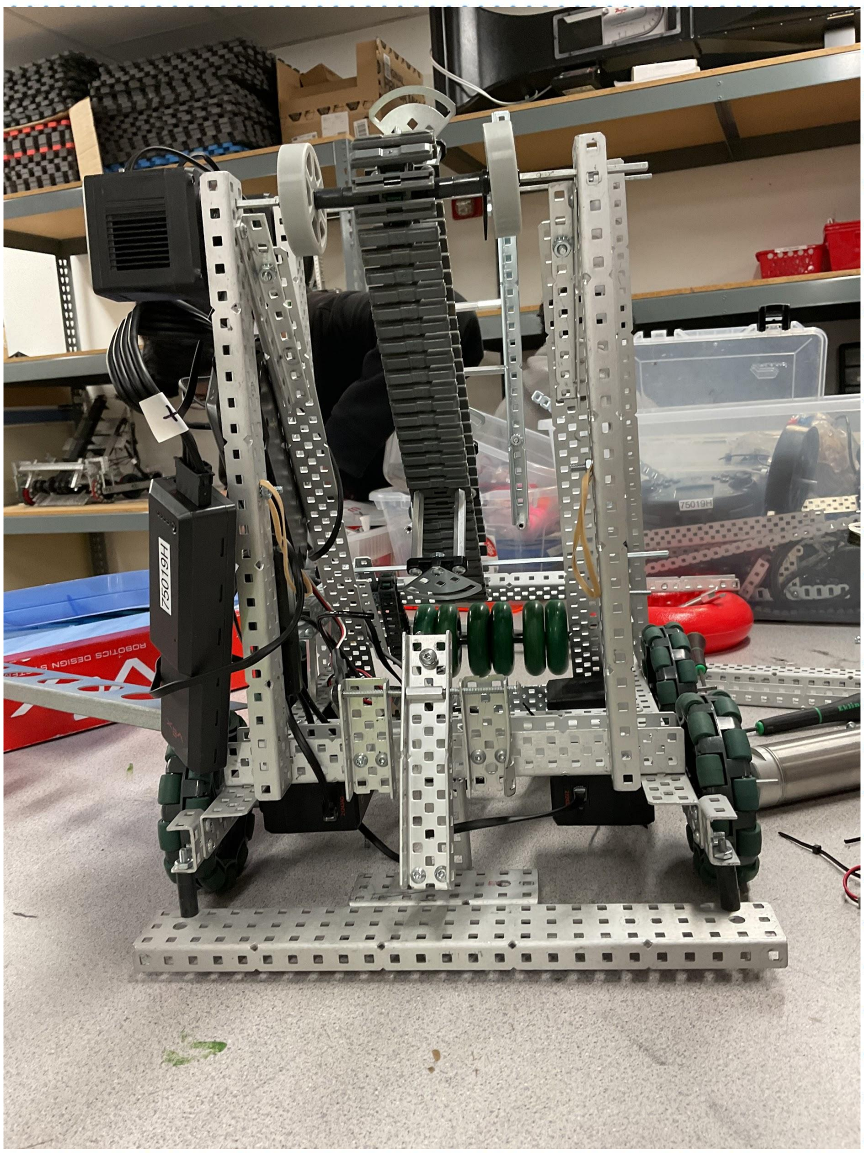
To enhance the stability and control of our robot during competition, we made a crucial modification by adding a reinforced backplate. This component serves an essential role in ensuring that the stake remains securely attached to the robot, preventing it from shifting or becoming dislodged during high-speed movements. One of the key issues we identified was that without a solid backplate, the stake was more prone to wobbling or even detaching when the robot made sharp turns, sudden stops, or rapid accelerations. This lack of stability could lead to inconsistencies in performance and potentially cost valuable points during a match.

By carefully designing and positioning the backplate, we significantly improved the robot's ability to handle dynamic movement, especially in competitive environments where quick decision-making and maneuverability are crucial. The backplate acts as a structural reinforcement, keeping the stake firmly in place even when the robot experiences strong forces from acceleration or braking. During testing, we observed that with this addition, the robot could take sharper turns without losing control and come to abrupt stops without the stake shifting unpredictably.

Moreover, we made sure that the backplate was constructed from durable yet lightweight materials to avoid adding unnecessary weight to the robot. This balance between strength and efficiency ensures that we maintain high levels of performance without sacrificing speed or agility. Additionally, the precise placement of the backplate allows for optimal weight distribution, which helps improve the overall center of gravity and traction of the robot. This means that, even during intense movements, our design minimizes slippage and instability, keeping the robot's interactions with the stake as consistent and controlled as possible.

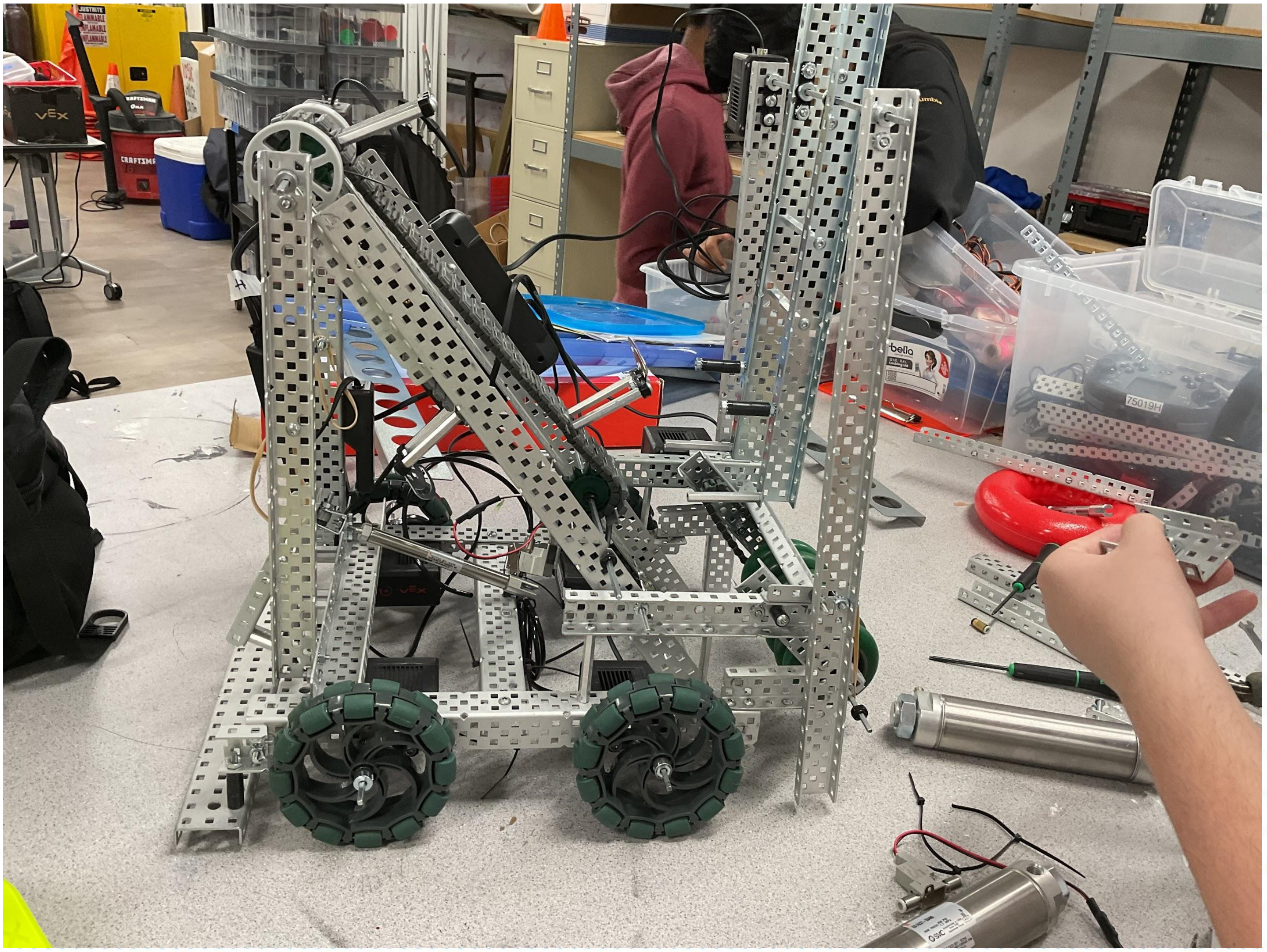
THANKSGIVING BREAK

Overall, adding the backplate was a game-changing upgrade that directly contributes to the robot's stability, reliability, and competitive advantage. It allows our robot to maintain better control under high-pressure scenarios, reducing the risk of performance errors while maximizing precision. With this improvement, we are confident that our robot will be much better equipped to handle the fast-paced, high-intensity demands of competition.



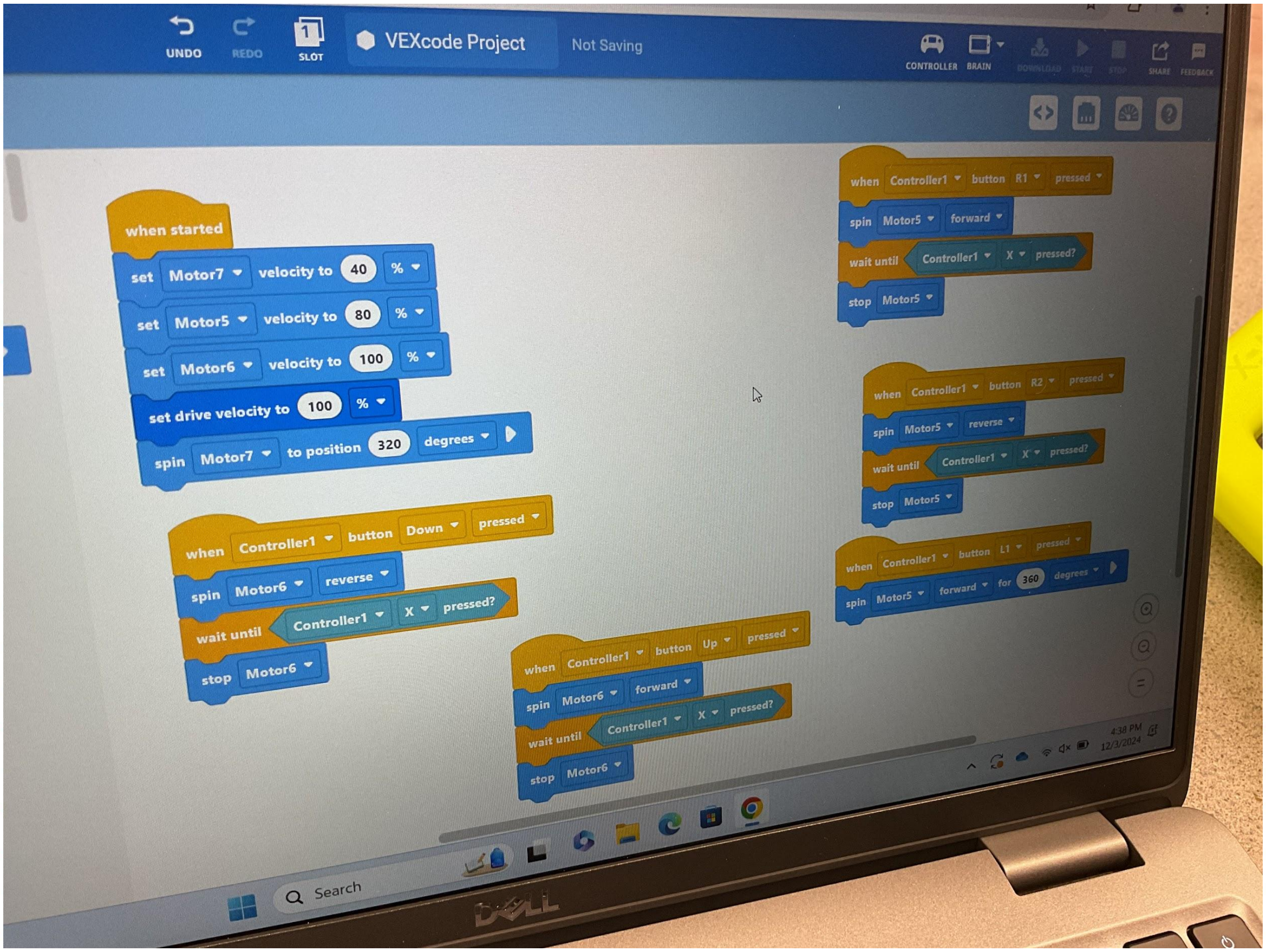
This version provides a much deeper explanation of the problem, solution, benefits, and competitive impact of adding the backp

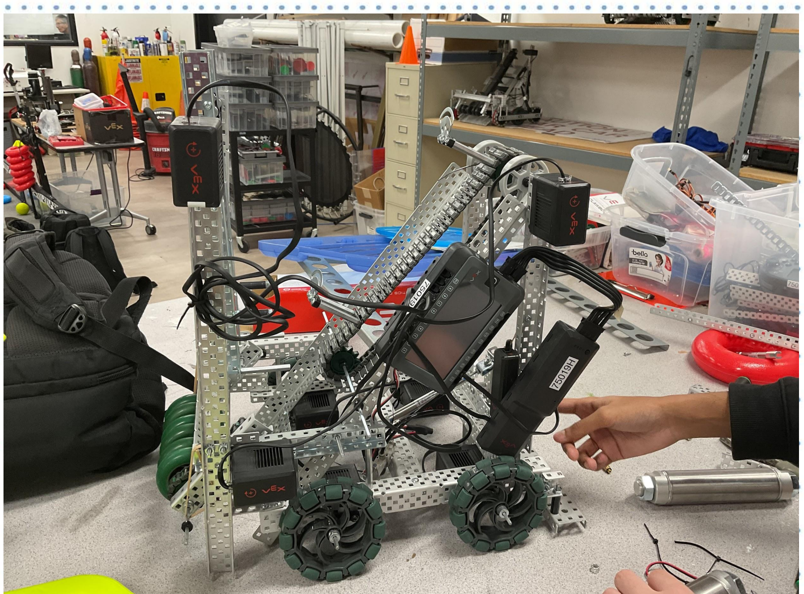
THANKSGIVING BREAK



We also pushed the intake system into the drivetrain to fit into the length requirement. We also changed the ramp plate to have a better approach angle onto the ring. We have also added an arm to send the ring up to the stake better stability and the spinning rod to push the rings further up the conveyor belt.

Coding and Other Changes





Today we did not make major changes, in the top image we can see the code used for the robot. We were trying to figure out what velocity had the highest power and torque, next we have also changed the location of the pneumatics because it got in the way of the conveyor belt so to ensure the conveyor belt performs as it should we have moved the pneumatics away from its range of motion.

Here's the detailed code explanation of the code from last slide:

1. Initialization and Setup (When Started Block)

- Set Motor Velocities
  - The program starts by setting the velocity for Motor 7 to 40%, Motor 5 to 80%, and Motor 6 to 100%.
  - This controls how fast each motor will run when activated. Different values suggest that each motor has a distinct role in the robot's movement.
- Set Drive Velocity
  - The drive velocity is set to 100%, meaning the robot's overall drive system is configured for full-speed motion.
- Spin Motor 7 to a Specific Position
  - The program commands Motor 7 to rotate 240 degrees.
  - This suggests that Motor 7 is responsible for a positioning mechanism, possibly an arm, claw, or intake system that needs to move to a starting position before further actions take place.

2. Controlling a Motor with the Controller's Down Button

- When the Controller's 'Down' Button is Pressed:
  - Motor 6 is set to rotate in reverse continuously while the button is held.
  - The program then waits until the button is released.
  - Once the button is no longer pressed, Motor 6 stops immediately.
  - This setup is useful for momentary control, meaning Motor 6 only moves while the button is actively being pressed.

3. Controlling a Motor with the L1 Button

- When the Controller's 'L1' Button is Pressed:
    - Motor 5 is activated and starts spinning when L1 is pressed.
    - The program waits until the button is released.
    - Once released, Motor 5 stops spinning.
    - This type of control is likely used for an action like lifting, grabbing, or launching an object, where precise control is necessary.

4. Controlling a Motor with the L2 Button

- When the Controller 'L2' Button is Pressed:
    - Motor 7 is activated and starts spinning.
    - The program waits until the button is released.
    - Once released, Motor 7 stops spinning.
    - Like the L1-controlled motor, this could be used for a robotic arm, claw, or another actuator requiring precise user control.

5. Controlling a Motor with the R1 Button

- When the Controller's 'R1' Button is Pressed:
    - Motor 6 is activated and starts spinning.
    - The program waits until the button is released.
    - Once released, Motor 6 stops spinning.
    - Given that Motor 6 was also used in the 'Down' button control, it might be part of an intake or scoring system, where R1 provides a secondary way to activate it.

This program sets up the robot's motors with an initial movement sequence and provides the user with manual control over key functions through the gamepad controller. The code ensures that motors only move when needed, making it energy efficient and precise. Each button press activates a specific motor, making the robot versatile and easy to operate during competition.

Advantages:

- Easier to start
- More efficient
- Shorter code
- Simpler to read and understand
- 5 sections of code
- Divided into sections for easier access to parts
    -

Today was entirely dedicated to testing and fine-tuning our robot's intake system, ensuring that it performs as expected under competition conditions. While there was no visible physical progress in terms of building new components or making structural modifications, the testing phase was crucial in refining the robot's functionality. Testing allows us to identify potential weaknesses, inefficiencies, or inconsistencies in performance before we finalize the design for competition.

Our main focus today was on evaluating the intake system, which plays a critical role in our scoring mechanism. After multiple trials, we observed that the system was functioning exactly as intended, efficiently moving the rings through the conveyor and positioning them correctly for scoring. However, we noticed that small variations in motor speed were affecting the ring's final position on the stake. If the intake was running too fast, the rings tended to overshoot the stake, making it difficult to score consistently. On the other hand, if the intake was too slow, the rings were falling short, leading to inefficient scoring attempts.

To address this, we spent a significant amount of time tuning the motor speed to find the perfect balance—one that allows the rings to travel smoothly through the conveyor and land precisely on the stake every time. Adjusting motor velocity might seem like a small task, but in competitive robotics, every fraction of a second and every minor adjustment can make the difference between winning and losing. Ensuring that our robot can consistently and accurately place rings on the stake is a top priority, as it directly impacts our ability to score points during matches.

Although today's session didn't involve major structural changes, testing is one of the most important phases of development. It allows us to validate our design decisions, optimize our performance, and ensure that everything is working exactly as planned before competition day. With today's successful fine-tuning, we now have a fully functional intake system that operates with precision, making our robot more reliable and efficient in actual gameplay scenarios.

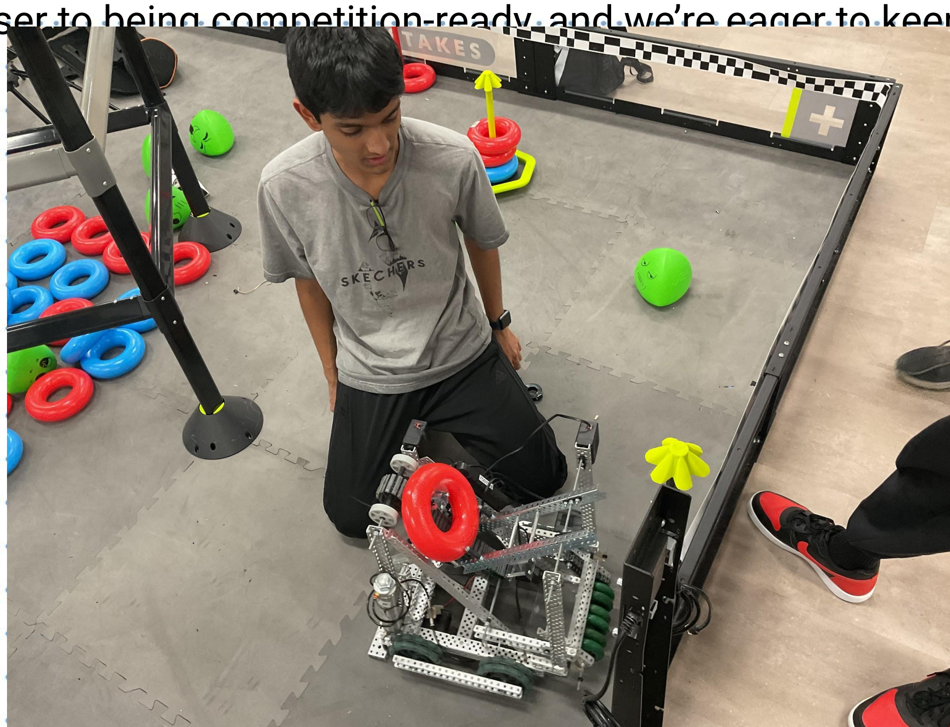
Overall, while there isn't much physical progress to document, today was a critical step in improving our robot's consistency. We now have a well-calibrated system that maximizes our ability to score points efficiently, setting us up for success in upcoming matches.

WEEKLY REPORT

We made several modifications to our design to enhance the robot's performance and meet the length requirements. First, we repositioned the intake system into the drivetrain to ensure it fits within the specified dimensions. Additionally, we redesigned the ramp plate to achieve a better approach angle onto the ring, allowing for smoother operation. To improve stability and functionality, we added an arm to send the ring up to the stake with greater precision, as well as a spinning rod to push the rings further up the conveyor belt. Although today’s changes were not extensive, we focused on optimizing the robot’s capabilities. For instance, as shown in the code example, we experimented with different velocity settings to identify the ideal balance of power and torque. Furthermore, we relocated the pneumatics system, which previously obstructed the conveyor belt, to prevent interference and ensure the belt operates as intended. These adjustments collectively enhance the robot's efficiency and reliability.

Arm Building

We didn't have practice on Tuesday this week, but we had two very productive sessions on Wednesday and Thursday. During these sessions, we tackled several key improvements to our robot. One of the major changes was reinforcing the wheels. We added two metal C channels to enhance their durability and stability, which should help them withstand more intense action and provide better performance during the competition. In terms of programming, we resolved a significant issue in our code where the motors would unintentionally reverse when we were trying to move forward. With this fix, the robot should now move more smoothly and predictably in the right direction, giving us better control on the field. Additionally, we focused on refining the intake system, making some adjustments to improve its ability to pick up the rings more efficiently and consistently. This adjustment will make a big difference when we're trying to collect rings quickly during matches, which is crucial for our success. Looking ahead, our next practice session will be focused on working with pneumatics, and we're excited to continue refining our robot's capabilities in that area. It feels like every time we solve one problem, another one comes up, but that's just part of the building process. We're learning so much as we go, and it's rewarding to see our robot come together step by step. Each session brings us closer to being competition-ready, and we're eager to keep improving!



Project Testing

Name Autobots Date 12/11/24

Today, we made some significant advancements on the robot by implementing a couple of crucial modifications that have greatly improved its functionality. One of the primary changes was replacing the skateboard wheels on the intake system with new flex wheels. This adjustment has proven to be monumental because the flex wheels allow for a much smoother transfer of the ring to the stake. Previously, the old wheels struggled to facilitate the ring's ascent, especially while the robot was in motion, resulting in frequent failures to reach the top. With the new flex wheels, we're now achieving near-perfect success in getting the ring to the stake almost every time, which is a huge boost for our performance.

In addition to the wheel upgrade, we also acquired VEX storage boxes, which are a game changer for our organization. Prior to this, we often found ourselves wasting an inordinate amount of time searching for parts amidst the chaos of our workspace. The lack of organization made it difficult to locate the necessary components quickly, leading to frustration and delays in our progress. With the introduction of the storage boxes, we can now categorize and neatly store our parts, making them easily accessible. This newfound organization not only streamlines our workflow but also allows us to focus more on the actual work of refining and enhancing our robot, rather than getting sidetracked by the search for missing pieces.

Overall, these upgrades are not just minor tweaks; they represent significant strides toward improving our robot's efficiency and effectiveness. The combination of the flex wheels and organized storage will enable us to work more collaboratively and effectively as a team, ultimately leading us closer to our goals for this project. We're excited to see how these changes will enhance our performance in upcoming tests and competitions!

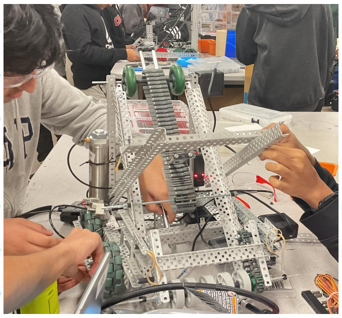
Project Minor upgrades

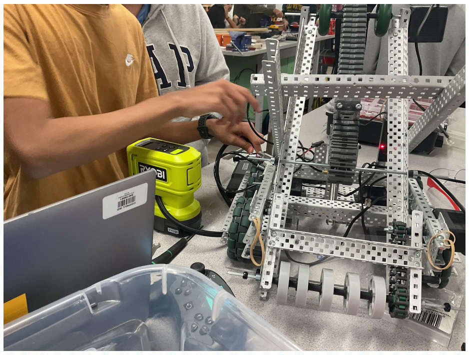
Long Arm Modification

Firstly, we decided to take our long arm apart to improve its performance. The original arm wasn't functioning as we had hoped, so we felt it was necessary to make some changes. We plan to replace the old arm with a new design that uses different parts, which should allow for better efficiency and more reliable operation. One of the key changes we're making is to connect the new arm to a motor in a different position, which should give us better control and more power. The old arm kept getting stuck at various points, which caused issues with the conveyor belt and hindered the robot's overall functionality. By replacing the arm, we're aiming to eliminate these problems and ensure smoother operation, which is essential for competition.

Pneumatics Reorganization

In addition to the changes made to the arm, we also focused on rearranging the pneumatics within the robot. Previously, the pneumatic system was not positioned in the best location, which led to an imbalance in the weight distribution. To address this, we've moved the pneumatics to a more strategic location that will help balance the weight more evenly across both axles. This will improve the robot's overall stability and prevent it from tipping over or losing control during movement. A better weight distribution also ensures that the robot performs more consistently and efficiently, especially during rapid movements or when interacting with other elements in the competition. We believe this reorganization will make a noticeable difference in our robot's performance.





New Air Pressure Machines

Another exciting upgrade we've made is gaining access to new, more advanced air pressure machines. These machines represent a significant improvement over the previous ones we were using. They are much more efficient, capable of pumping air into the pneumatic system at a much faster rate. This increased speed in air delivery means that the pneumatics can react more quickly to commands, allowing for faster and more precise movements of the robot’s components. The quicker response time is crucial for tasks that require rapid actions, such as lifting and lowering arms, activating the intake, o moving other mechanisms that rely on pneumatic pressure.

In addition to their speed, the new machines have a much higher PSI rating—160 PSI, to b exact. This higher PSI means the machines can provide significantly more pressure to the pneumatic system, which results in stronger and more consistent performance. The higher pressure not only makes the movements more powerful but also ensures that the pneumatics can perform under more demanding conditions without losing efficiency. For example, when we need the robot to move heavy components or make sharp, quick adjustments, the increased PSI ensures that the pneumatics can handle the load without struggle or delay.

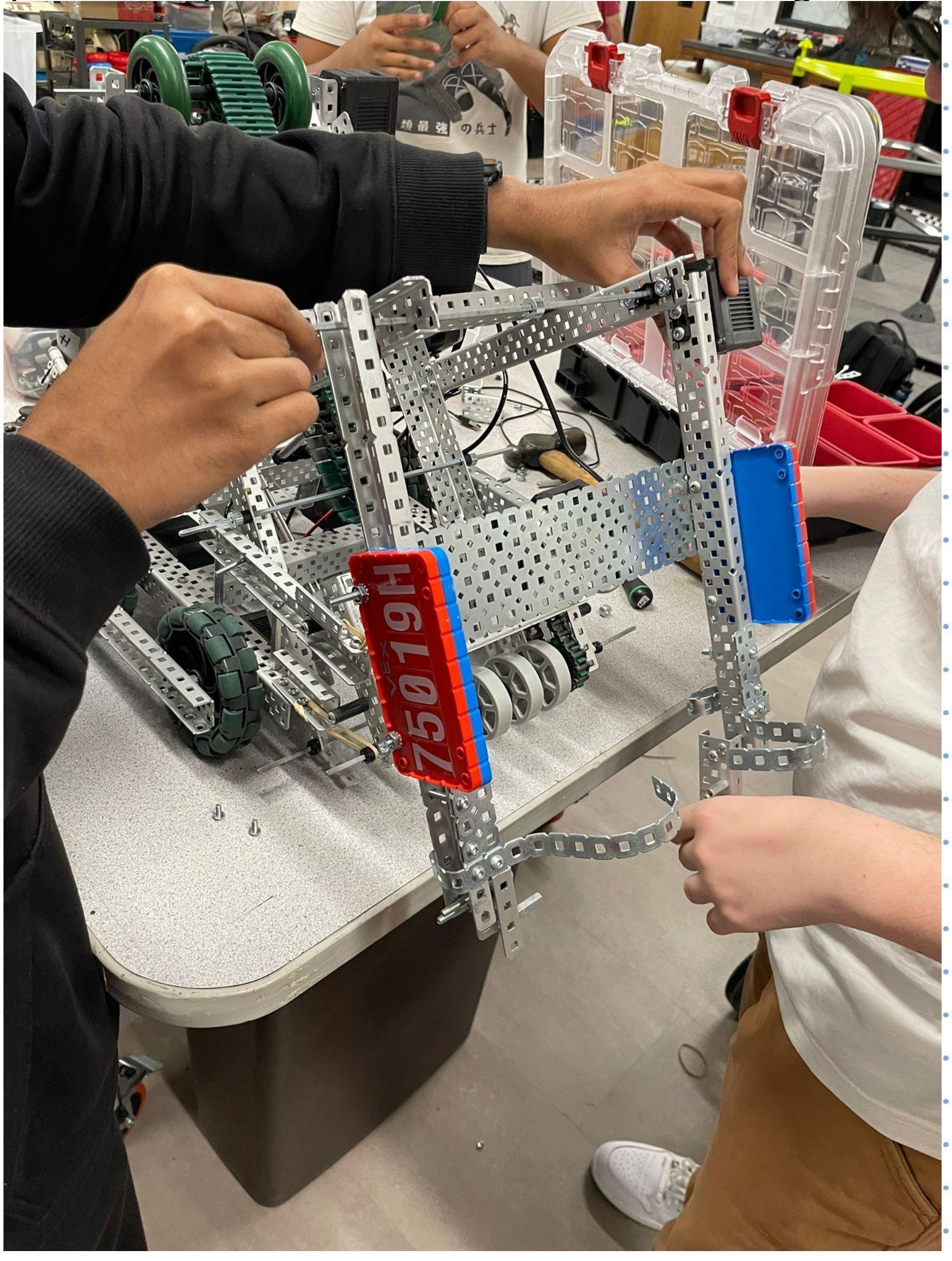
This upgrade is especially important for tasks where precision and speed are vital. Whether it’s actuating arms with high accuracy, activating the intake mechanism to quickly pick up objects, or using the pneumatics to adjust other elements of the robot in real-time, the faster and stronger air pressure makes all of these actions more reliable. With this more advanced air pressure system, we expect to see a noticeable improvemen in the robot's overall performance, especially in competitive environments where split-second decisions and actions can make the difference. This upgrade brings us closer to a fully optimized robot that will be more competitive and effective during the competition.

WEEKLY REPORT

This week, we made significant progress on the robot, although we didn't have practice on Tuesday. We were able to practice on Wednesday and Thursday, during which we focused on reinforcing and improving our design. To increase durability, we added two metal C-channels to the wheels, ensuring better stability during operation. We also fixed a critical issue in the code where the motors were running in reverse while moving forward, allowing for smoother and more intuitive control. Additionally, we made some adjustments to the intake system to enhance its ability to pick up rings more effectively. Looking ahead, we plan to work on pneumatics in the next practice session. It often feels like solving one problem leads to the emergence of another, but this iterative process has been key to our improvements.

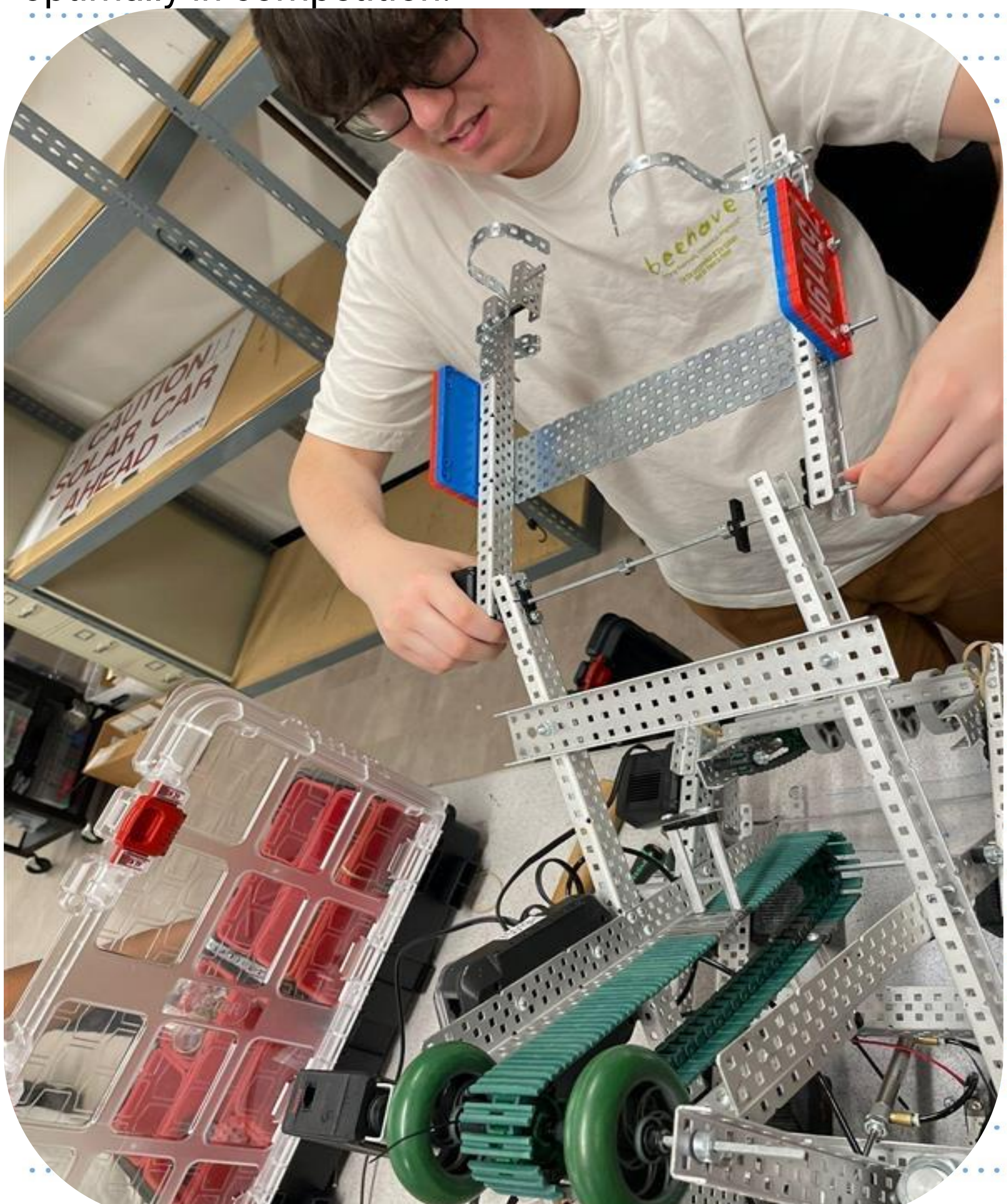
Today, we focused on minor but impactful changes to the robot. One of the most notable updates was replacing the skateboard wheels in the intake system with new flex wheels. This change has significantly improved the system's ability to pass rings smoothly to the stake, enabling nearly perfect success in getting the rings to the top, even while the robot is in motion. Previously, the old wheels struggled to achieve this consistently. Another major development was the addition of VEX storage boxes for our parts. This organizational upgrade is a game changer, as it allows us to keep our components neatly arranged. By spending less time searching for parts, we can devote more time to building and improving the robot, increasing our overall efficiency.

In the image below, we can see the arm being carefully fixed into place as we test its functionality. The main goal of this test is to check if the arm can successfully pick up a ring and position it onto the wall stake. We've made adjustments to the arm and its positioning, and this test will help us determine whether it performs as expected in a real-world scenario. Ensuring the arm can securely grab and place the ring on the stake is crucial for the robot's performance during matches. This step is an important part of the process as we continue fine-tuning our robot's capabilities.



We can see Sam and Shiva fixing up the arm of the robot together using C channels. Another new change is the addition of the number plates, they are red on side and blue on the other allowing us to swap easily on demand to change for blue alliance and red alliance in just 2 screws and bolts.

In this image, we can see Sam testing the reach of the arm to assess its effectiveness. According to Sam, the arm is functioning well so far, but he believes it might need to be slightly longer to improve its range and reach. His feedback is important as it helps us fine-tune the arm's design for better performance during tasks like picking up and placing rings. Making the arm longer could provide the added reach we need to work more efficiently, especially when the robot is positioned further from the wall stake. This test is just one step in the ongoing process of refining the robot's features to ensure it operates optimally in competition.



Sam testing the reach of the arm to assess its performance in picking up and placing rings. While the arm is working well so far, Sam suggests that it might need to be slightly longer to improve its reach and efficiency, especially when the robot is positioned farther from the wall stake. This test is a key step in ensuring the arm can successfully complete its tasks during matches, and any adjustments made will help optimize the robot's performance for competition.

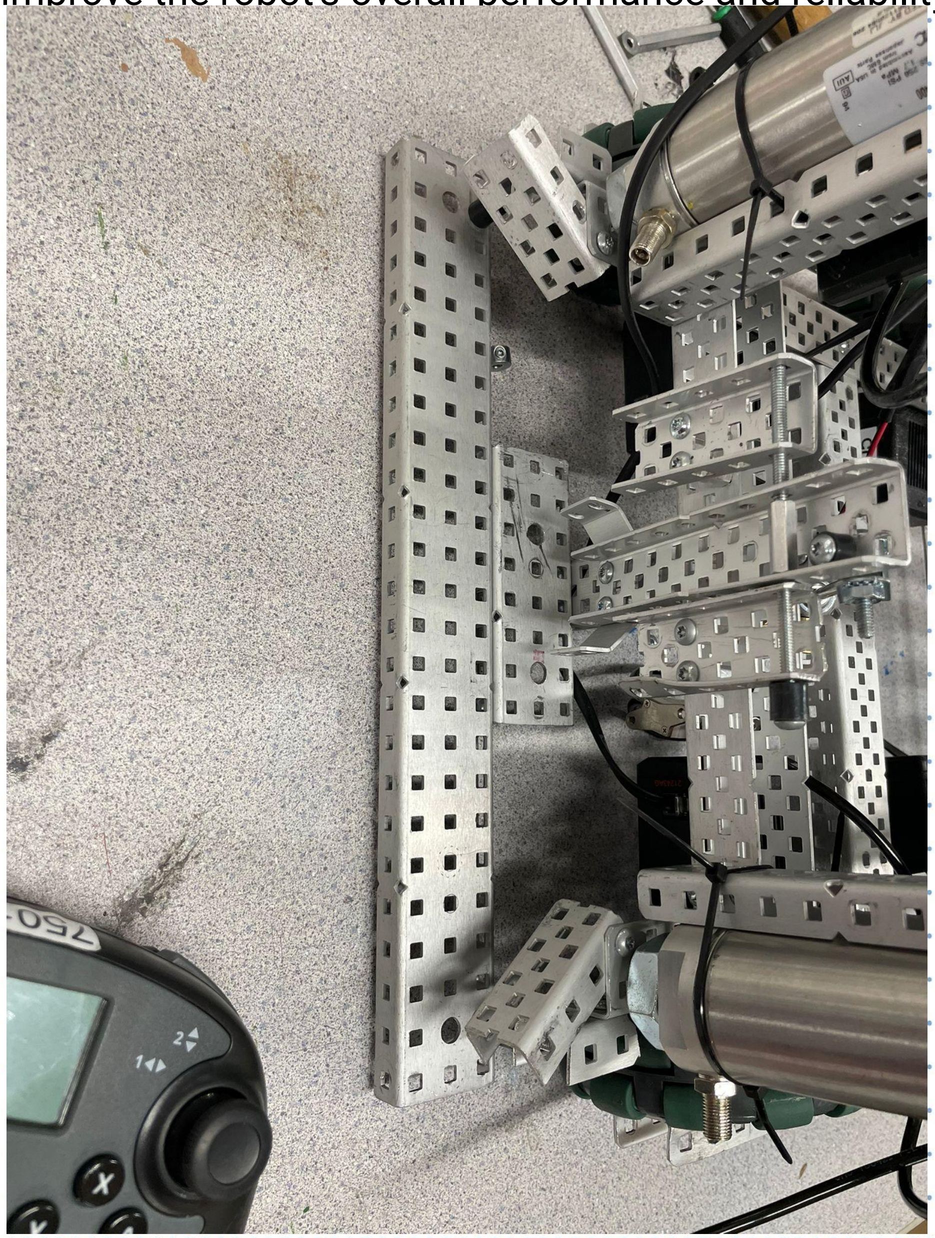
In this image, we can notice the addition of a bent metal piece around the arm, carefully placed to ensure that both sides of the arm remain perfectly aligned. This adjustment is crucial for maintaining parallelism, ensuring that the arm operates smoothly and efficiently. By adding this metal piece, we are reinforcing the structure and preventing any misalignment that could affect the arm's movement or performance. Ensuring the arm remains parallel helps improve its accuracy when picking up and placing rings, providing more consistent results during competition. This modification is a key step in fine-tuning the robot for optimal performance.

Here, we can see the addition of a bent metal piece around the arm, designed to ensure that both sides of the arm remain perfectly aligned and parallel to each other. This adjustment is crucial for maintaining the arm's accuracy and smooth operation. By reinforcing the structure with this metal piece, we are preventing any misalignment that could affect its performance during tasks like picking up and placing rings. This modification helps ensure the arm functions consistently and efficiently, improving the robot's overall performance in competition.

Project Arm work

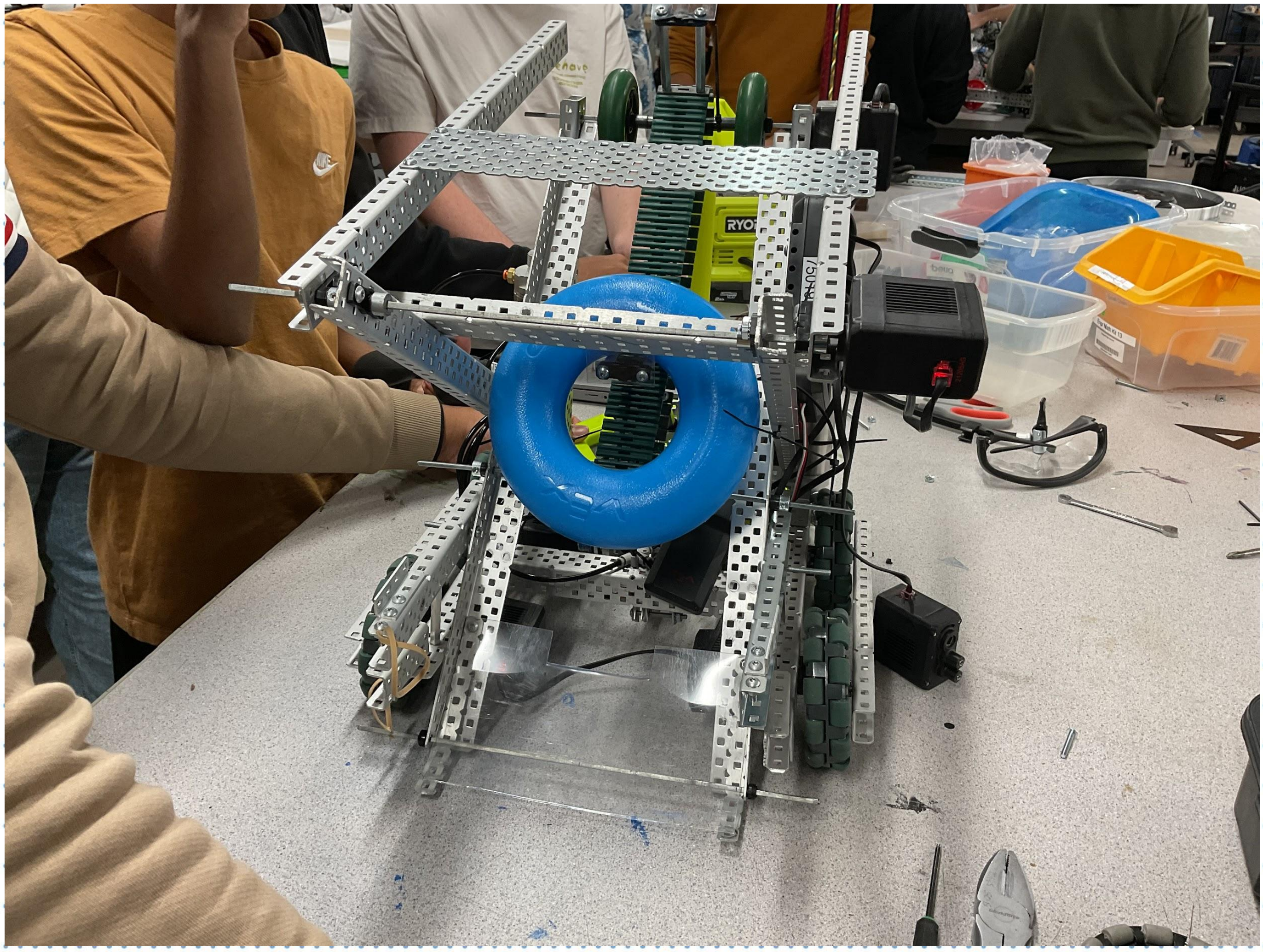
Name Autobots Date 1/7/25

In this image, we can see the back of the robot, with a focus on the hook mechanism. To improve its functionality, we made some adjustments by realigning the hook slightly forward, allowing it to engage more effectively with the stake. Additionally, we added small channels on the sides of the hook to prevent the stake from drifting off to the side during operation. These changes are aimed at ensuring the hook can securely hold and position the stake without any unintended movement, providing more stability and accuracy when performing tasks in the competition. This enhancement should help improve the robot's overall performance and reliability.



Here, we see the back of the robot with a focus on the hook mechanism. To improve its performance, we realigned the hook slightly forward and added small channels on the sides to prevent the stake from drifting off to the side. These adjustments ensure better stability and accuracy, allowing the hook to securely hold and position the stake during competition tasks.

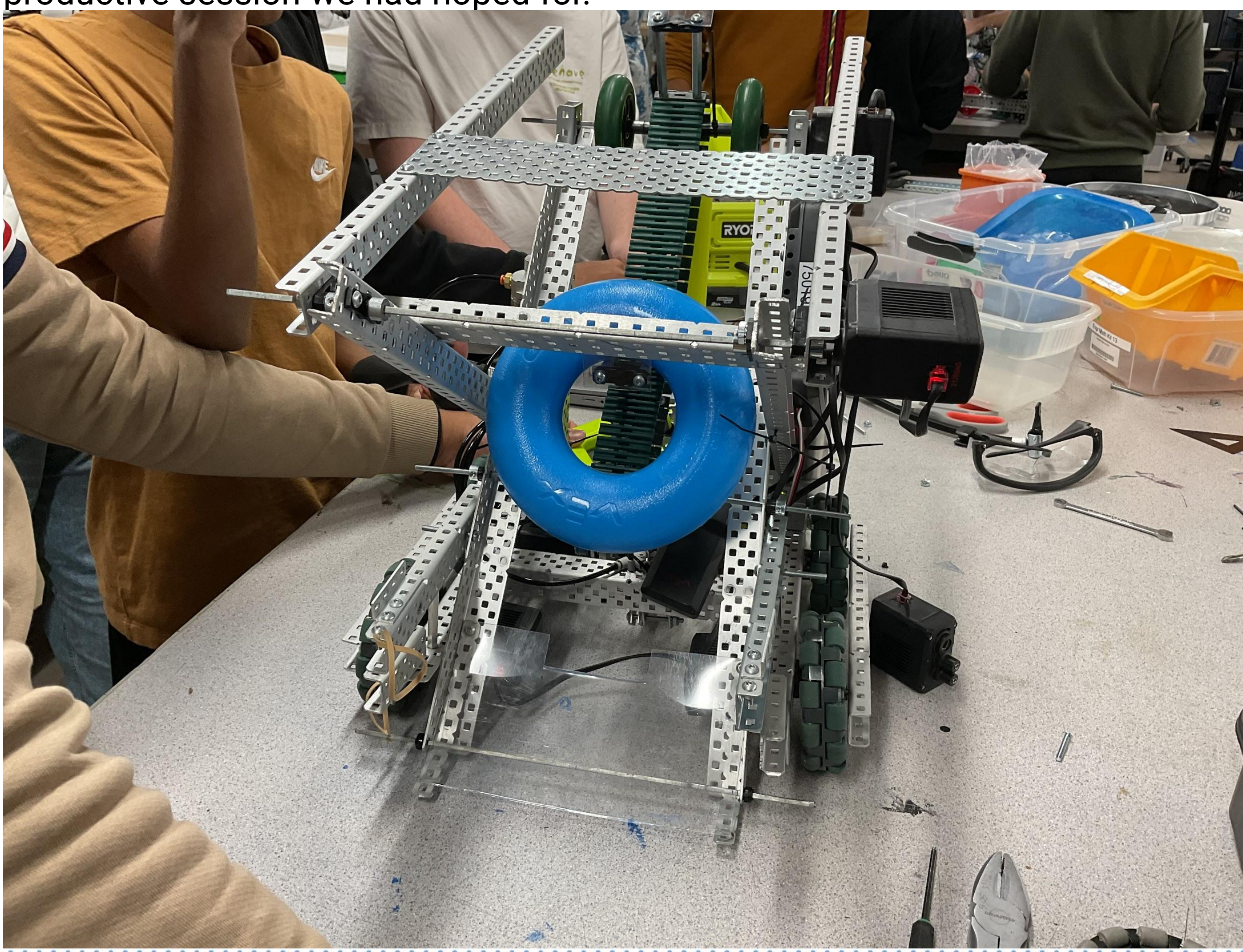
Today, we didn't make as much progress on the robot as we had hoped due to some members of the group being involved in other events, and a few people not having a ride home. As a result, our time was more limited than expected. However, we still managed to get some work done, primarily focusing on tidying up the wiring that connects to the brain of the robot. We also took the opportunity to test certain functions, such as the conveyor system, to ensure everything was working as expected. While it wasn't a particularly productive day, we were able to make some adjustments and verify that the core systems are functioning correctly.



Project Arm work

Name Autobots Date 1/8/25 Page 79

Today, we somehow made negative progress, which is almost a feat in itself—thanks to someone like Sam! He disconnected our perfectly functioning intake system for reasons unknown, and, of course, before fixing it, he went off to help another team—typical Sam. While dealing with that setback, we also struggled to replicate the old arm, which took more time than we anticipated. However, after a bit of trial and error, we finally managed to replicate the arm. Despite the chaos, we were able to overcome the challenges and make some headway, though it wasn't exactly the productive session we had hoped for.



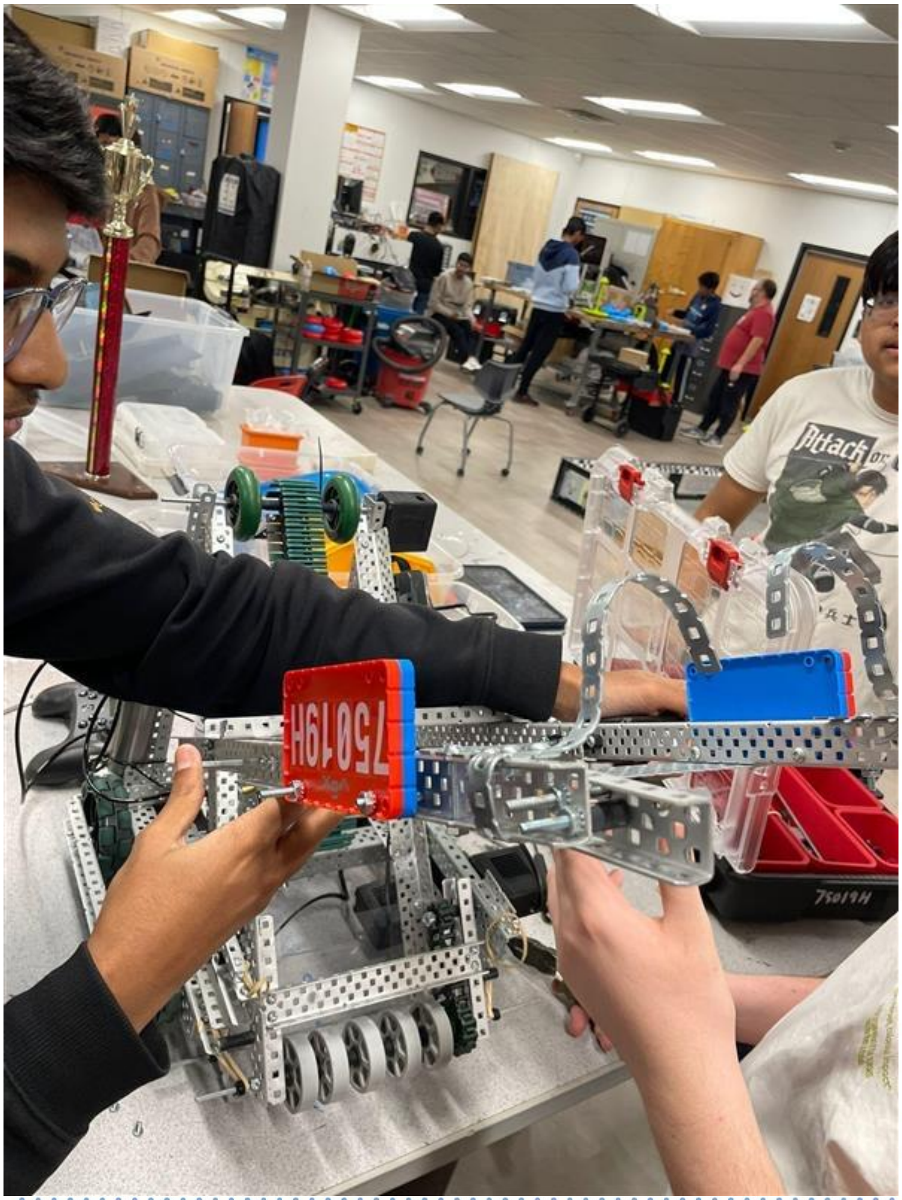
Yup that's the intake less robot looking like someone with no hands, cannot pick up any ring anymore.

Project Arm dismantle

Name Autobots Date 1/14/25

Rebuilding Intake

Today we just rebuilt the intake system as my teammates were working on making the arm better and function easier. This took us the entire period and since we wanted to test it we asked to borrow someone else's battery To test our robot on the course.



Shiva fixing the arm in place

The arm plays a critical role in getting the rings on higher stakes

Project Rebuild intake

Name Autobots Date 1/15/25

Today, our main focus was on rebuilding the intake system of the robot. While some of my teammates were busy working on improving the arm to make it function more efficiently and with greater ease, we concentrated on ensuring that the intake system was in top shape. We spent the majority of the practice session carefully reassembling and fine-tuning it, making sure that all the components were properly aligned and functioning as intended. This process took the entire period as we worked to make sure the intake system would perform well during the upcoming tests. Our goal was to ensure the robot could reliably pick up objects and perform the tasks it was designed for, so getting the intake system right was critical.

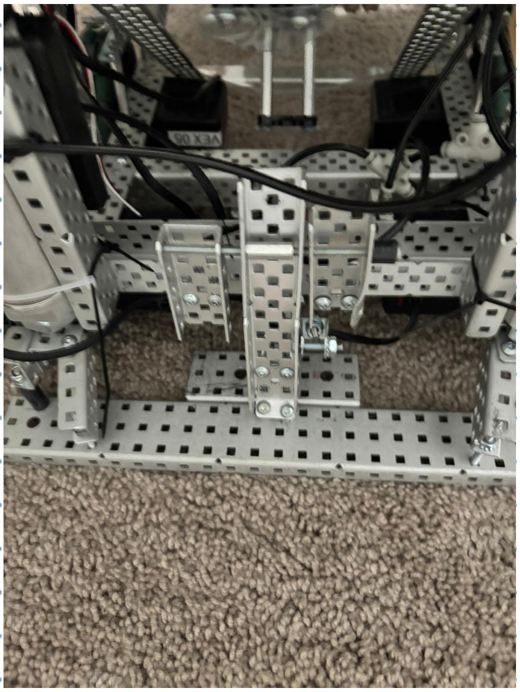
Once we had completed the rebuild, we were excited to test the system and see how it worked in practice. However, we ran into an issue—our robot didn't have a battery ready for use, which meant we couldn't power up the system to do any live tests. In order to move forward with our testing, we reached out to another team in the workshop to ask if we could borrow one of their batteries. Thankfully, they were generous enough to lend us one, and this allowed us to proceed with the testing on the course.

With the borrowed battery in place, we finally had the opportunity to test the robot on the course and see how the rebuilt intake system performed in action. The testing session was crucial to verify whether the adjustments we made would result in smoother operation and better efficiency. We also used the opportunity to observe how well the intake system interacted with other components, ensuring everything worked together as expected. While we faced some initial hurdles, such as the battery issue, we were able to make some solid progress and gather the data needed to continue refining the robot for the upcoming competition.

Pneumatics Repositioning

On Tuesday, we focused on making a critical improvement to the pneumatics system by repositioning the piston. Initially, the piston was mounted behind the C channel, but this setup wasn't providing the best alignment or performance. To address this, we decided to move the piston to the side of the C channel. This simple shift allowed us to optimize the pneumatic system's function and efficiency. By relocating the piston, we not only ensured a better mechanical alignment but also improved the flow and responsiveness of the pneumatic components.

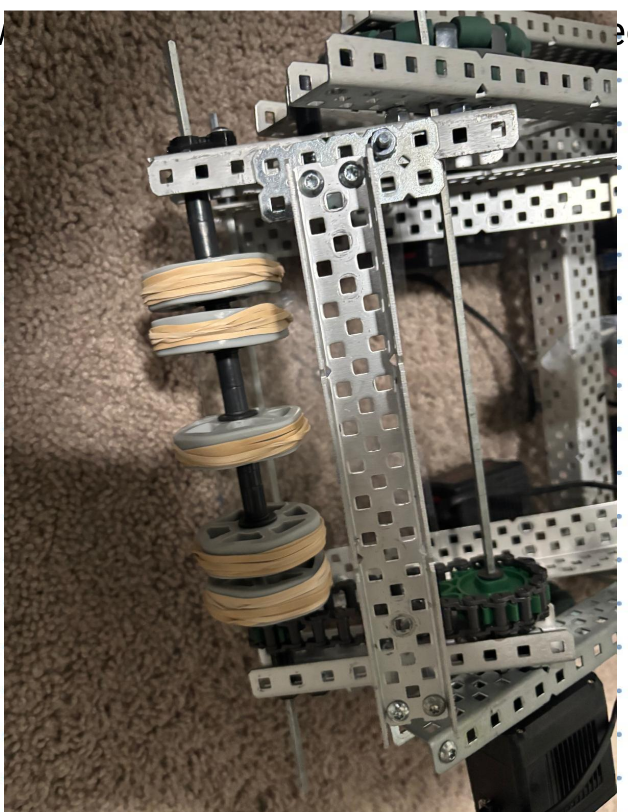
This repositioning has several benefits for the robot's overall performance. The side placement of the piston provides a more direct line of movement, which translates to smoother operation of the robot's mechanisms that rely on pneumatics. Moreover, the new positioning helps with weight distribution and balance, reducing the risk of instability during movements. With this adjustment, the pneumatic system operates more fluidly, contributing to more consistent and effective performance when performing tasks in the competition.



Repositioning the piston to the side of the C channel for better alignment and smoother pneumatic operation, resulting in improved balance and efficiency.

In addition to the pneumatics adjustment, we also focused on improving the intake system by adding rubber bands. The rubber bands were strategically placed to give the intake more grip and flexibility. This modification allows the intake to more effectively grab and hold onto rings, ensuring a smoother collection process. Without sufficient grip, the intake had difficulty picking up rings reliably, especially when the robot was moving quickly or when the rings were positioned at awkward angles. By adding the rubber bands, we created more friction, which helps the intake mechanism capture the rings more consistently.

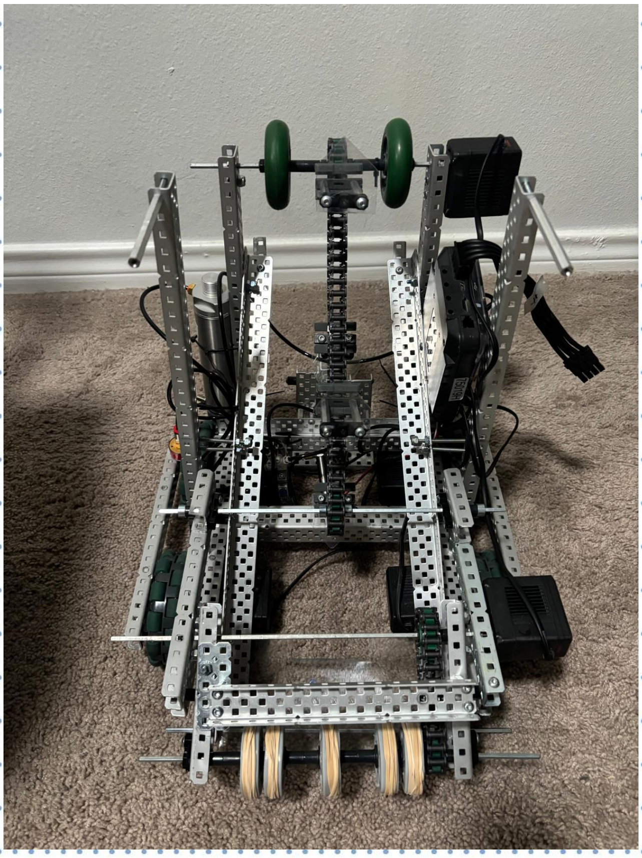
The rubber bands provide the necessary tension to enhance the overall performance of the intake system. With this additional support, the intake can now operate more efficiently, reducing the chance of rings slipping out or not being picked up at all. This improvement also increases the robot’s versatility, allowing it to handle a wider range of ring sizes and positions without issues. Overall, this modification has made the robot’s intake system more reliable and effective, which is essential for performing w ection is key to scoring points.



Adding rubber bands to the intake system for enhanced grip and improved ring collection, ensuring more reliable performance during the competition

Another important adjustment we made was to the conveyor belt, which was having issues with rings flipping over before we could even grab them properly. The original positioning of the conveyor belt wasn't ideal, and the rings were not aligning correctly for pickup. To fix this, we decided to move the conveyor belt back a bit, allowing for a better angle when the rings were fed into the intake system. This adjustment ensures that the rings stay in the correct orientation, making it much easier for the intake to grab them without issues.

By shifting the conveyor belt, we've significantly improved the intake's ability to pick up rings without them flipping over or getting stuck. This adjustment ensures a more reliable flow of rings into the intake system, which is crucial for efficient operation during matches. With the rings positioned better and more securely, we're able to maintain a faster pace in collecting and placing rings, giving us a significant advantage in a fast-paced competition setting. This simple yet effective change has greatly improved the functionality of the robot.



Shifting the conveyor belt back to improve ring alignment and prevent flipping, ensuring a smoother intake process for more reliable collection

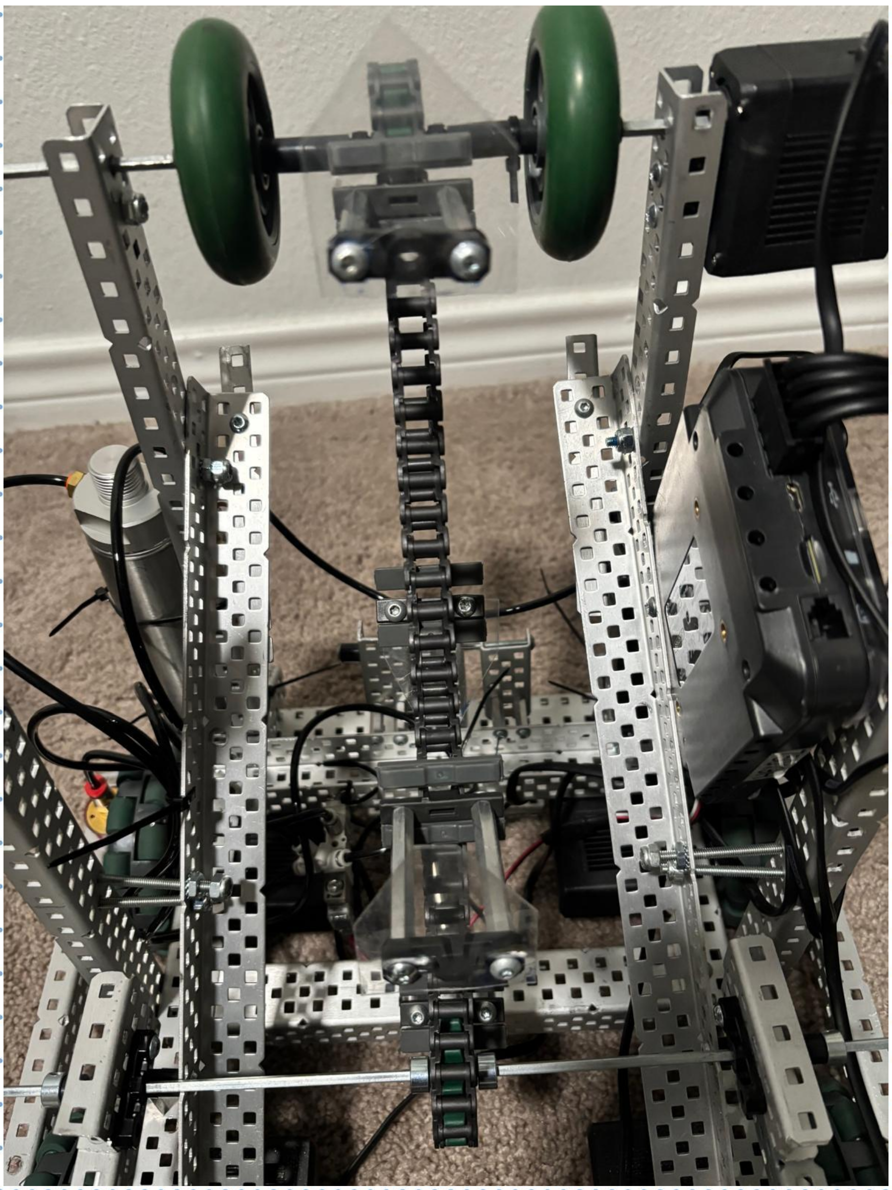
One of the important upgrades we made recently was adding bearings to all the shafts in the robot. The bearings were installed to ensure that the shafts could move more freely, reducing friction and wear on the moving parts. In robotics, friction can be a major factor that hinders performance, as it wastes energy and can lead to mechanical failure over time. By adding bearings, we eliminated much of that resistance, allowing the shafts to rotate smoothly and efficiently. This simple yet crucial modification improves the overall functionality of the robot, allowing all the moving components to operate with greater precision.

The bearings themselves serve a dual purpose: they reduce friction while also providing better stability to the shafts. When the shafts move more smoothly, the robot's actions become more consistent and responsive, whether it's for precise movements or for quicker adjustments in real-time. With this addition, the robot can perform its tasks more effectively, especially during competition when timing and accuracy are critical. As a result, the bearing upgrade enhances the reliability of the robot during both practice and competition scenarios.

Another advantage of the bearings is that they help prevent premature wear and tear on the robot's internal components. Without bearings, the friction between moving parts could cause them to degrade more quickly, which could lead to frequent maintenance and costly repairs. By reducing friction, the bearings extend the lifespan of the shafts and other connected components, allowing us to focus on more important aspects of the robot's performance instead of constantly dealing with maintenance issues.

Furthermore, the addition of bearings not only improves the movement of the shafts but also aids in maintaining the robot's overall balance and stability. With smoother shaft rotation, there is less chance of erratic movements or unsteady motion. This improvement ensures that the robot can handle more demanding tasks without losing control, which is crucial in high-pressure situations where even small adjustments can make a difference. By optimizing the movement of all the shafts, we’ve made the robot more reliable and capable of performing complex tasks without risk of failure.

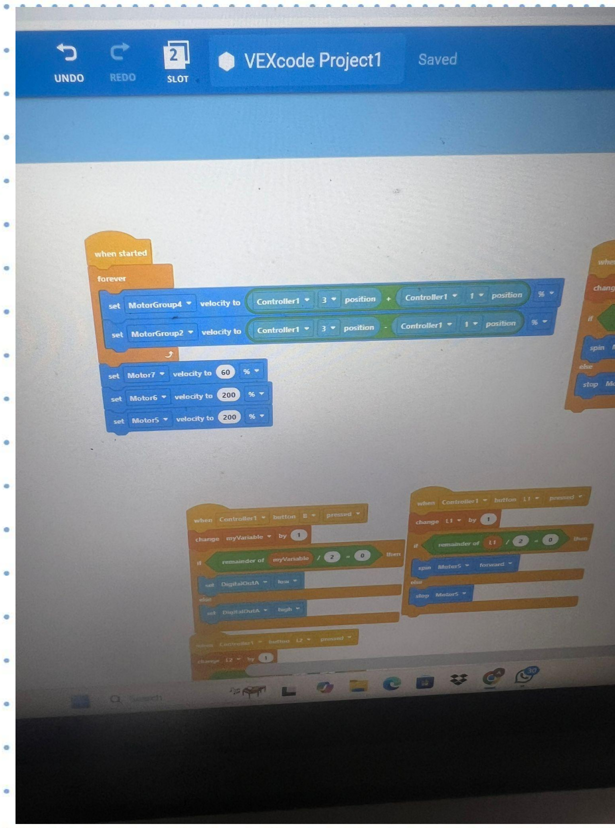
In the long term, this upgrade to the bearings provides us with better control over the robot's systems and contributes to overall efficiency. The smoother motion reduces the load on motors and other drive systems, which can help conserve battery life and prevent overheating. As we continue to fine-tune the robot, this addition will help maintain peak performance, ensuring that it remains competitive in every challenge we face.



Adding bearings to all the shafts for smoother movement, reduced friction, and improved stability, allowing the robot to perform more efficiently and reliably in competition.

Coding

I will explain all of this code more detailed line by line in the next few slides



Project Organizing

Name Autobots Date 1/22/25 Page 90

1. When started

- This block is the entry point of the program. Everything inside this block runs automatically when the robot starts.

Set Motor1 velocity to 100% power

- This command sets Motor1 to run at 100% of its maximum speed.
- Velocity determines how fast the motor will spin.

Set Motor2 velocity to 100% power

- This command sets Motor2 (likely the second drivetrain motor) to 100% speed.
- Ensures that both motors move at the same speed.

Spin Motor1 forward

- Starts spinning Motor1 in the forward direction at the previously set speed (100%).

Spin Motor2 forward

- Starts spinning Motor2 in the forward direction at the previously set speed (100%).

Spin Motor3 forward

- Another motor (likely an arm, claw, or auxiliary motor) is set to spin forward.

Spin Motor4 forward

- Another auxiliary motor (possibly the other side of a lifting mechanism) is activated.

This code provides max potential fro our robot sending out all power

1. When Controller 1 Button R1 pressed
    - This block listens for Button R1 on the controller to be pressed.
    - When R1 is pressed, the code inside the block runs.
2. Set Motor3 velocity to 50%
    - Reduces Motor 3 speed to 50% power.
    - Likely used for finer control of an attachment (like a claw or arm).
3. Spin Motor3 forward
    - Moves Motor3 forward at the newly set 50% speed.
4. When Controller 1 Button R2 pressed
    - This block runs when Button R2 is pressed.
5. Set Motor3 velocity to 50%
    - Again, sets Motor's speed to 50% power.
6. Spin Motor3 in reverse
    - Makes Motor3 spin in the opposite direction.
    - If Motor3 controls a claw, this would open it instead of closing it.
7. When Controller 1 Button L1 pressed
    - This block executes when Button L1 is pressed.
8. Set Motor4 velocity to 50%
    - Sets Motor's speed to 50%.
9. Spin Motor4 forward
    - Starts Motor4 forward at 50% speed.
10. When Controller 1 Button L2 pressed

- This block runs when Button L2 is pressed.

11. Set Motor4 velocity to 50%

- Again, sets Motor's speed to 50%.

12. Spin Motor4 in reverse

- Moves Motor4 in the opposite direction.
- If Motor4 is an arm motor, this lowers the arm instead of raising it.

When Controller1 Button R1 pressed

- Detects when the user presses R1.
- Executes the enclosed code.

Set Motor3 velocity to 50%

- Limits Motor3's speed to 50% power.

Spin Motor3 forward

- Activates Motor3 in the forward direction at 50% speed.

When Controller1 Button R2 pressed

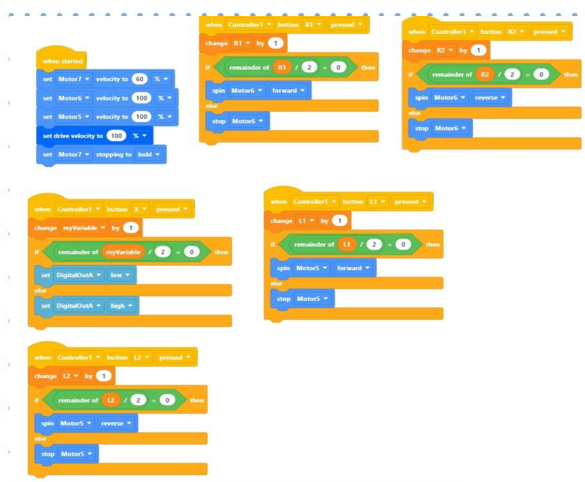
- Executes when Button R2 is pressed.

Set Motor3 velocity to 50%

- Sets Motor3 speed to 50% again.

Spin Motor3 in reverse

- Moves Motor3 backward at 50% speed.



When Controller1 Button L1 pressed

- Runs when L1 is pressed.

Set Motor4 velocity to 50%

- Sets Motor4's speed to 50% power.

Spin Motor4 forward

- Moves Motor4 in the forward direction.

When Controller1 Button L2 pressed

- Runs when L2 is pressed.

Set Motor4 velocity to 50%

- Sets Motor4's speed to 50% power.

Spin Motor4 in reverse

- Moves Motor4 in the opposite direction.

Summary of the Code's Functionality

- Controls robot movement and auxiliary mechanisms using a game controller
- Pressing specific controller buttons activates motors at different speeds
- Separate motors are used for drivetrain and attachments (claw, arm, etc.)
- Motors can move forward and reverse, depending on button inputs
- Speed is controlled dynamically (100% for movement, 50% for precision tasks)

Small Changes Before Competition

To enhance the functionality of our robot, we made modifications by cutting and attaching a plastic piece to the back. This adjustment prevents rings from entering the intake system, which could otherwise cause jamming or inefficiencies during operation. By ensuring that rings do not interfere with the intake, our robot can maintain a smooth and uninterrupted performance. This small but significant improvement will help maximize the efficiency of our design, allowing us to focus on refining other crucial aspects of the robot's performance. Every minor detail contributes to overall effectiveness, and this simple modification enhances our competitive edge.

Our competition is scheduled for Saturday, February 1, 2025, and we feel confident about our progress so far. We have dedicated significant time to testing and improving different elements of our robot, ensuring that it functions optimally under competition conditions. The mechanical structure, drive system, and intake mechanism are all performing as expected, giving us a solid foundation to build upon. However, while our robot is nearly competition-ready, we recognize that there is still work to be done, particularly in perfecting our autonomous mode. Fine-tuning the autonomous routine is crucial, as it can give us a significant advantage during the match by scoring points efficiently before driver control begins.

As we approach the final stages of preparation, our focus is on rigorous testing and final optimizations. Our team is working diligently to ensure that every movement and function of the robot is precise and reliable. The last few days before the competition will be spent troubleshooting any remaining issues, making necessary refinements, and practicing driving strategies to maximize our scoring potential. We believe that with continued effort and attention to detail, we will be fully prepared to perform at our best during the event. This competition is a great opportunity for us to showcase our hard work and teamwork, and we are eager to see how our robot performs against other teams.

Today, we focused on improving the pneumatics system to enhance our ring pickup mechanism. Currently, our success rate for properly picking up rings is around 80%, which is decent but not as reliable as we would like. A more efficient pneumatic system will ensure that the intake mechanism operates consistently, reducing the chances of rings slipping or being misaligned. We tested different air pressure levels, adjusted the positioning of the pneumatic components, and examined potential friction points that might be affecting performance. By refining these aspects, we aim to increase our success rate and make our intake mechanism as reliable as possible.

With our competition coming up on Saturday, February 1, 2025, every improvement matters. While our robot is mostly competition-ready, we know that small refinements can make a big difference in match performance. A higher success rate in picking up rings will allow us to execute our strategies more efficiently, giving us a competitive advantage. Autonomous mode, in particular, relies on precision and consistency, so optimizing the pneumatics is a key part of our final preparations. Our team is working hard to ensure that all mechanical, pneumatic, and software systems are fine-tuned to function seamlessly under competition conditions.

As we approach the final days before the event, we will continue testing and refining every aspect of our robot. Our plan is to conduct rigorous trials, simulate real match scenarios, and gather data on how well our adjustments are working. If necessary, we will make additional modifications to further increase the reliability of our pneumatic system. We are determined to enter the competition with a robot that performs at its best, and we are excited to see how all of our hard work translates into real match results. With each day of preparation, we grow more confident in our robot's capabilities and our ability to compete at a high level.

To improve our robot's performance, we made a crucial modification by cutting and attaching a plastic piece to the back. This adjustment prevents rings from entering the intake system, which could otherwise cause jamming or inefficiencies during operation. By ensuring that rings do not interfere with the intake, our robot can function more smoothly and reliably during matches. Even small improvements like this can make a significant difference in competition, as they help eliminate potential issues that could disrupt our scoring ability. Our team carefully tested the modification to ensure it was effective, and we are confident that this adjustment will enhance our overall performance.

Our competition is set for Saturday, February 1, 2025, and we believe we are mostly ready to compete. We have spent a lot of time refining our design, testing different strategies, and making improvements to maximize efficiency. The drivetrain, intake, and scoring mechanisms are functioning as expected, and our robot is responding well to driver control. However, we still need to perfect the autonomous portion of our routine. Autonomous mode is critical because it allows us to score points before the driver-controlled period begins, giving us an early advantage in matches. With a few more refinements, we are confident that we can make our auton as consistent as the rest of our robot.

As we approach the final stretch of preparation, our focus is on fine-tuning every detail and running as many practice matches as possible. We will continue testing our modifications to ensure that everything is working flawlessly under real match conditions. Our goal is to eliminate any last-minute issues and maximize our scoring potential. We are also working on improving communication and coordination within our team to ensure smooth execution during the competition. With each day of practice and refinement, we are growing more confident in our robot's capabilities. We are excited to compete, showcase our hard work, and see how our robot performs against other teams.

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Participating in VEX Robotics has been an incredibly fun and rewarding experience for our team. From brainstorming ideas to building and coding our robot, every step of the process has challenged us to think creatively and solve problems together. The hands-on nature of designing and refining our robot has given us the opportunity to apply engineering concepts in a real-world setting while also allowing us to experiment with different strategies. Whether it's making last-minute adjustments before a match or celebrating when our robot successfully completes a task, every moment has been filled with excitement and learning.

One of the best parts of VEX Robotics has been the teamwork and collaboration required to succeed. Each person on our team brings different skills to the table, whether it's programming, building, or strategizing for competition. Working together to solve problems and improve our robot has strengthened our communication and problem-solving abilities. The challenges we've faced along the way, from fixing unexpected issues to refining our autonomous code, have made every success even more satisfying. The competition environment also adds an exciting element, pushing us to think quickly and adapt to different scenarios.

Beyond just building a robot, VEX Robotics has created unforgettable experiences and friendships. Traveling to competitions, meeting other teams, and seeing all the creative designs that others have come up with has been inspiring. The sense of accomplishment after a well-executed match or a successful design change makes all the hard work worth it. This journey has not only taught us valuable technical skills but has also shown us the importance of perseverance, teamwork, and innovation. No matter the outcome of our competitions, the experience itself has been an incredible adventure, and we look forward to continuing to learn and grow through robotics.

Competition

At regionals we placed 4th place in the qualifiers for alliances. Since we placed top 8 in the qualifiers, we got to pick a team to for the alliances tournament. In the alliance tournament we placed 3rd in the semi-final round with a score of 11-17 because our teammate had technical issues at the start and gained barely any points.for our team.

In the skills match we got first place with a combined score of 41. We got 33 points on the driver portion and 8 points on the autonomous part. We got second in the region (first got 47 points total) and first place in our school. We ran out of time to repeat the autonomous section because they decided to close it 30 minutes early. We were able to run a second driver's section, but got a lower score of 28 points. We got a lower score instead of a higher score because we made mistakes in the run from the start. For example, we missed some rings on the first try and had to waste seconds on getting it again.

During the auton, we planned to get a minimum score of 11 points, but could only get 8. Early that day, our coder accidentally deleted the code, so he had to recreate it from memory in a limited amount of time, so the best he could do was enough to get 8 points. He couldn't recreate it perfectly because we didn't have time to measure the distances of the course between the robot and the rings.

We got 1st place by a point because they second place team had a combined total of 40 points. Third place was the other team from our school to move onto state and got 36 points, auton and driving combined.

We were able to win 2 trophies at regionals. We won the award for best score in the skills competition and the think award for having the best code for auton.

Picture of our team holding both awards.

Progress to State

The Vex State level competition occurs on Saturday, March 1st. We decided to start by reviewing the old bot.

Things to Improve:

- Drivetrain can be faster with a different setup instead of wheels straight to motors
- The intake had a consistency issue as the axle had disconnected from a motor mid match
- We still need to add a mechanism to add rings to the high wall stakes
- Our auton got us only 8 points, but we plan to increase this amount to at least 36 minimum
- We also got a lower score during the official skills round compared the score we got in a practice round earlier that day
- Shiva plans to practice the driving section more, so he can consistently acquire over 30 points, but we also plan to increase to a minimum of 50 points
- Our bot was missing a climbing extension to gain 3 additional points during the skills round, but we decided that we would only add this if we had the time and/or space on the robot after all the modifications and changes we plan to make in the 1 month until the VEX State competition

We made the VEX state competition because they gave our team an invitation to compete since they believe that our skills were state level. We also made the TSA VEX state competition, but this isn't until early April, so we are not as focused on it for now.

We first started by researching the different ways to win at the state competition since winning the skills event and tournament are not the only way. Beside winning, you can advance through other awards they give out as well as receiving an invitation.

Awards to Advance with:

1. Excellence Award
2. Tournament Champions (2 teams since the tournament is alliances)
3. Tournament Finalists
4. Design Award
5. Robot Skills Champion
6. Innovate Award
7. Think Award
8. Amaze Award
9. Build Award
10. Create Award

You can also win the "Judges Award", "Sportsmanship Award", and "Volunteer of the year Award", but these do not qualify for events as they are not directly tied to the success or skill or your team/robot.

We decided to aim for the design and create award as they are focused on documentation and build process, style, and uniqueness.

On the following page(s) I will describe how to win the awards and how we plan to.

Performance-Based Awards:

1. Tournament Champions – Win the regional championship by forming a strong alliance,
having a well-strategized robot, and consistently performing at a high level.
2. Tournament Finalists – Reach the finals in the championship. Even if you don't win, being a
finalist secures a Worlds qualification.
3. Robot Skills Champion – Have the highest combined score in Driver Skills and Autonomous
Coding Skills. Focus on efficiency, speed, and precision in both categories.

Judged Awards:

4. Excellence Award – The highest award. To win this, you need:
   ○ Strong performance in matches and skills challenges.
   ○ A well-documented Engineering Notebook (detailed and organized).
   ○ Great teamwork, professionalism, and effective communication during judging interviews.

5. Design Award – Maintain an exceptional Engineering Notebook that follows the design
process and demonstrate a well-thought-out robot.
6. Innovate Award – Showcase a unique, creative, and effective design feature that enhances
performance.
7. Think Award – Excel in programming and autonomous performance. A strong Coding Skills
score and a clear explanation of programming logic will help.
8. Amaze Award – Have a high-performance, well-built, and reliable robot that demonstrates
overall excellence.
9. Build Award – Present a robot with a solid, durable, and well-organized construction.
10. Create Award – Shows innovation in strategy, gameplay, or robot design that stands out.

Team Members New/Current Roles:

Shiva: Driver / Primary Builder

Arnav: Coder

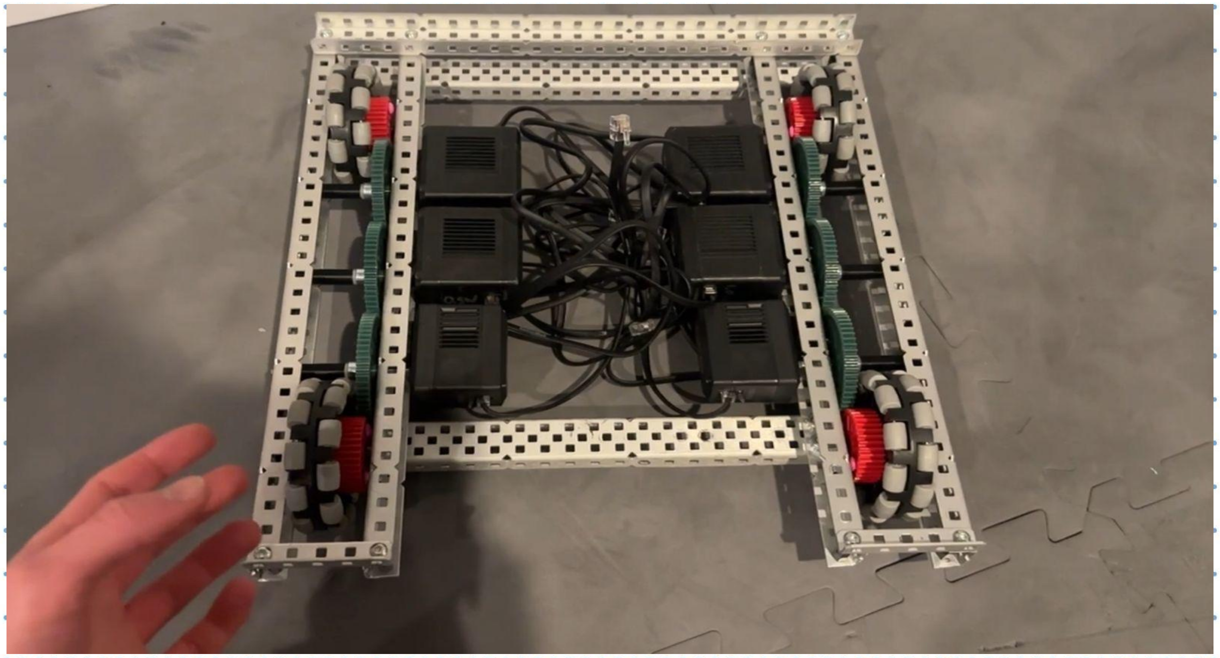
Dhruv: Primary Documenter

Geetesh: Documenter

Neerav: Builder / Quality Control

We are planning to make a new robot to compete in the State. We want to build a secondary robot that is better in every way because the we found several issues with the old one and many changes we could make.
The main reason for wanting to create a new robot is the drivetrain. The current drive train uses a direct wheel to motor style. After researching robots and other teams youtube videos, I determined that a 6 wheel drive train with a gear system has been consistently faster than drive trains with 4 wheels and no gear system.
It will be 3 wheels each side. The front and back wheels are omni-directional, which the middle one will be traction wheels. The outer wheels are used to be able to turn in multiple directions, while the inner wheels will give traction so we don't serve or drift during swift turns.

Example:



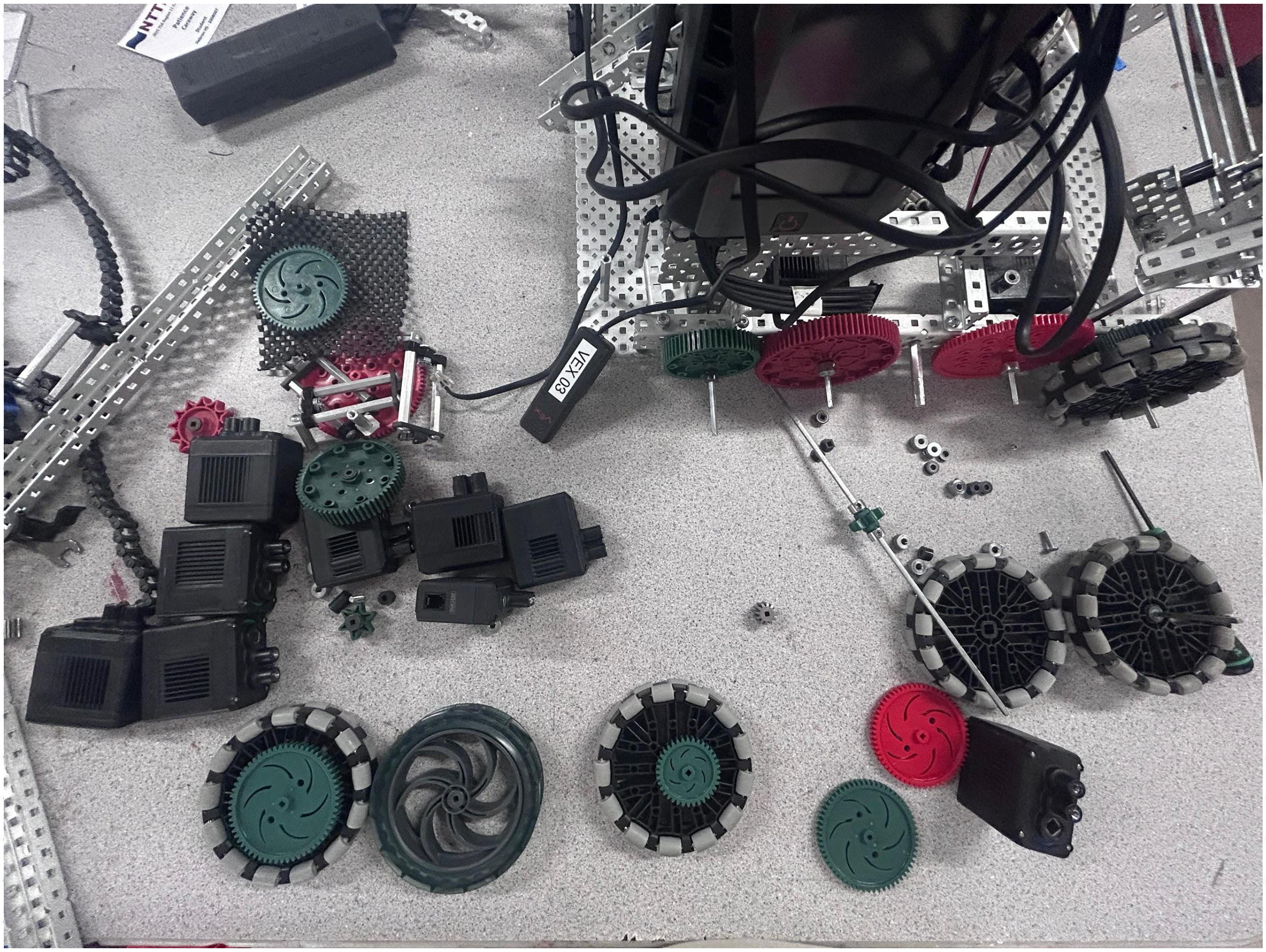
Part Collection

Before we start building, we are going to collect basic parts that we will need to build a new robot.. We want to keep the old bot assembled in case this new one doesn't work out and to allow our coder to start working on new auton programming as we build new robot.

Parts List:

- Motors
- Spare batteries
- C-channels
- Star nuts
- Rubber nuts
- Pneumatics parts
- Omni-directional tires
- Traction tires
- Wires
- Brain
- Spacers
- Gears
- Sprockets
- Stand-offs
- Track
- Poly-carb
- Rubber bands

These are the main things we gathered, but we got more specific parts for certain things we will built.



Here are some of the parts we have collected. As you can see in the image, we are taking parts off the robots of teams that did not advance to state at regionals. These other parts have limited pieces, such as motors and certain gear sizes, especially C-channels already cut to the shape we want.
We also went through there kits for the spare pieces that they gathered in their kit, so that we don’t have to waste cutting pieces that already exist and are readily available.

We also needed to collect some of the most limited items, such as the poly-carb. I found a big sheet of it in the corner with all the other supplies, as we need it to make hooks and clamps for the intake and conveyor belt.

This is polycarb a clear plastic sheet, but it's thick and easy to cut through. It's the perfect material for pieces we need to be smooth and sturdy as we can drill holes and shape it.

We also tried to get as many blue motors as possible because they are better for drive trains but there are barely any. We got 2 red motors and there is a good supply of green motors to get at any time.

DriveTrain

We are starting with the drivetrain first since it is arguably the most important part. We need to increase the speed compared to our old bot and also make sure we don't drift or swerve.

We are using multiple examples online to create our version of a 6 wheel drive train. Instead of doing 1 motor to each wheel, we will use a gear system that will move the middle wheel with the outer wheels.

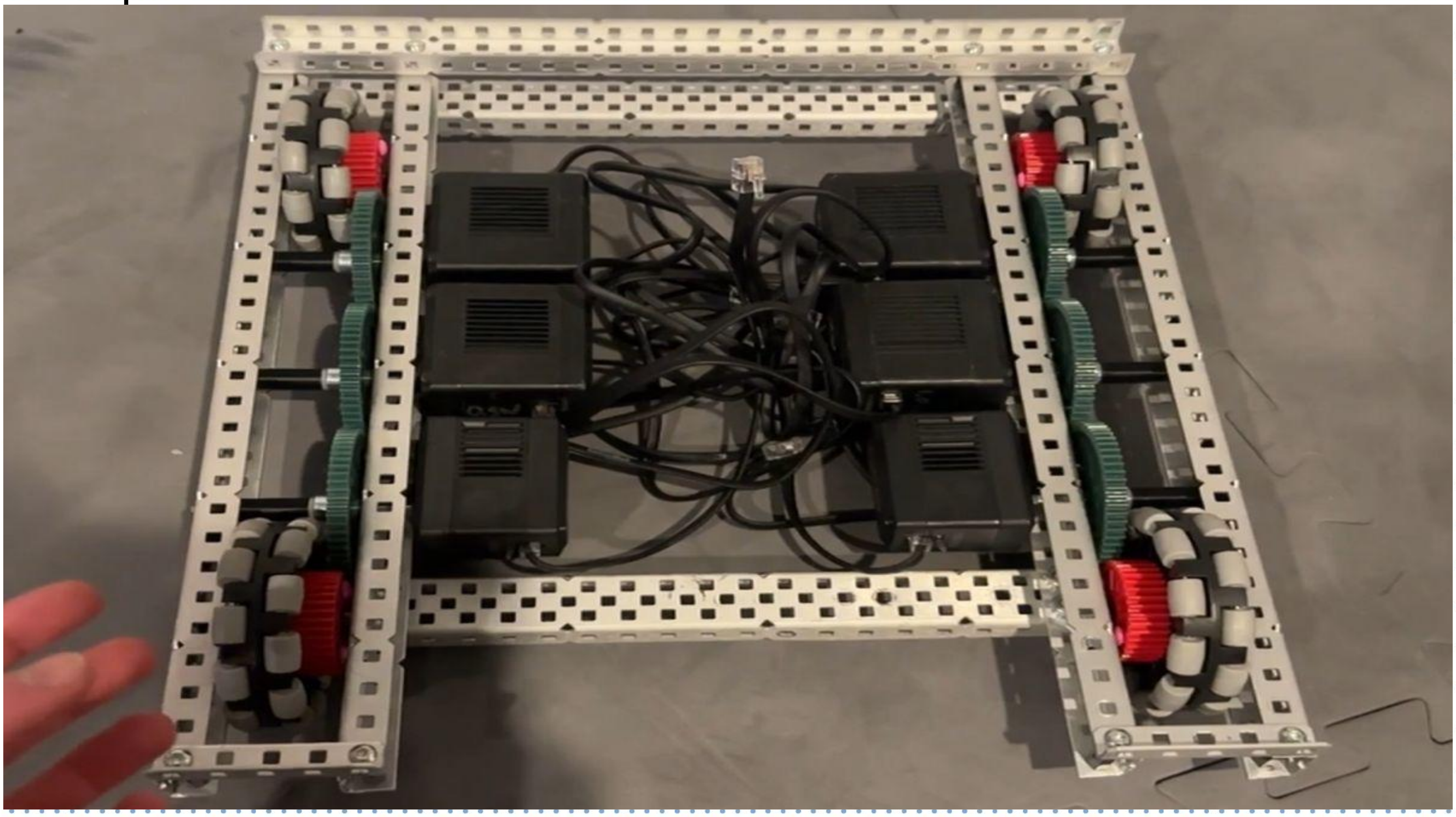
The outer wheels are going to be omni-directional wheels, while the middle wheels will be traction wheels. These outer wheels are connected to motors but a gear is between the motor and wheel. This gear connects to a gear between them that will hold the middle traction wheel.

So as the outer wheels spin, the gear system will rotate the traction wheel connected to the middle gear.

While Neerav and Shiva are planing this out and starting it, Geetesh will be assisting Arnav as he starts programming the autonomous section with the old robot, so he can find new ways to create more efficient routes for the autonomous. This will help him create the auton for the new bot, when it's complete, faster and gain a minimum of 36 points.

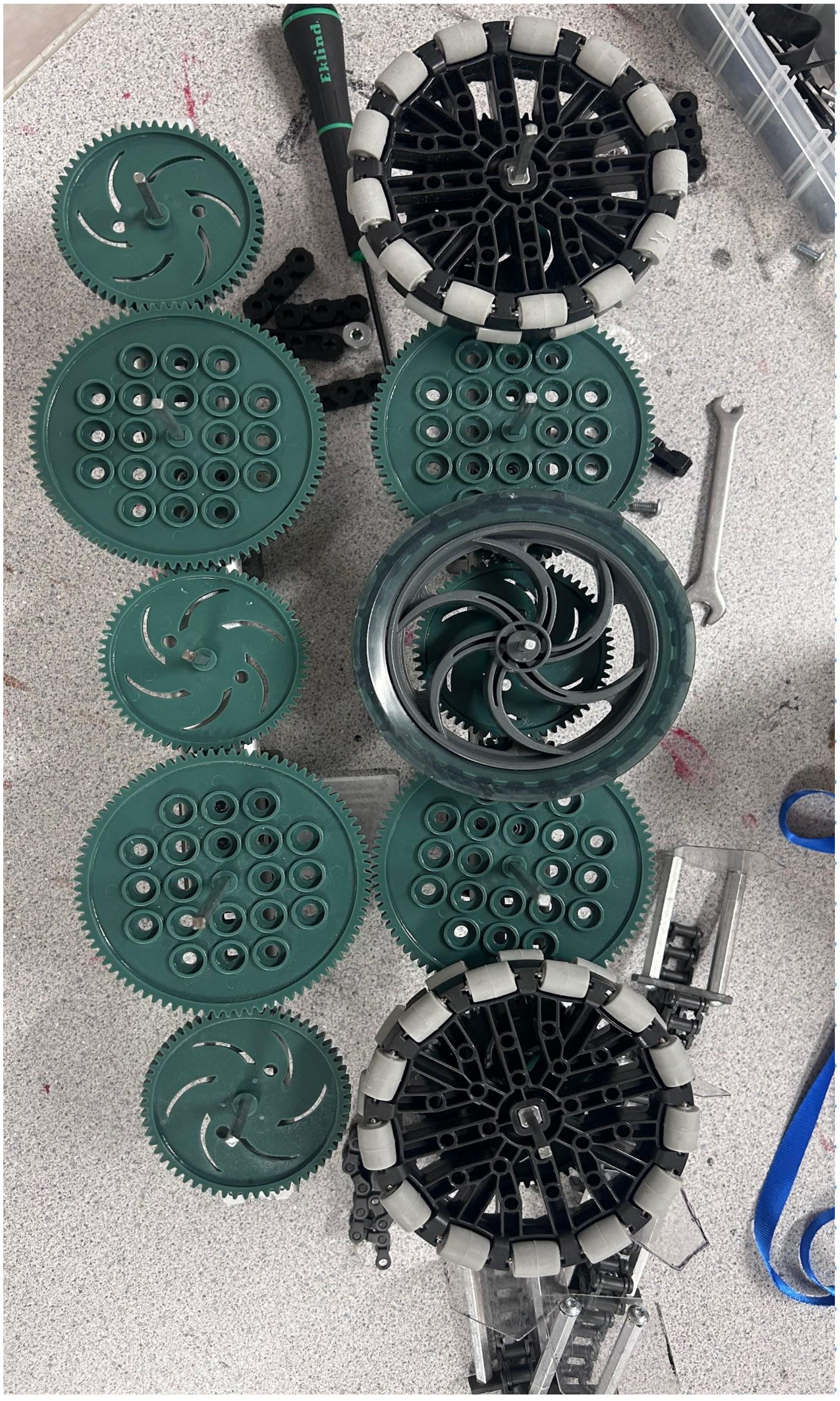
I will be taking pictures and documenting it later instead of at the same time, so I can clearly identity the build progress and accurately explain/describe it in the docs.

Example:



Unlike the example, we will use 6 wheels and 4 motors. We are using this overall design, but we will have the motors placed with the outer wheels, not the gears.
Where they placed the middle black stand-off is wheel are traction wheels will be placed.
We will also have the drivetrain pods connect similarly with a piece at the back and one near the front or middle depending on how we decide to build the intake and the height of the conveyor belt.
Our builds will add channels to both sides of the wheels for structural stability and to protect the gears from debris and other teams robots hitting them during a match.

Current Progress:



As you can see in the photo to the left, We are starting the drive train by aligning gears and wheel up to see if its a practical design before we screw every piece into place.

The wheels are placed on the small gears, while the big gears are used to connect them and make them rotate at the same time.

We used a big gear to small gear ratio because it increases the overall rotation speed.

We are building both at the same time, so they can be matching and move simultaneously.

Project Current Drivetrain Progress

Name AutoBots Date 2/7/25

Current Progress:

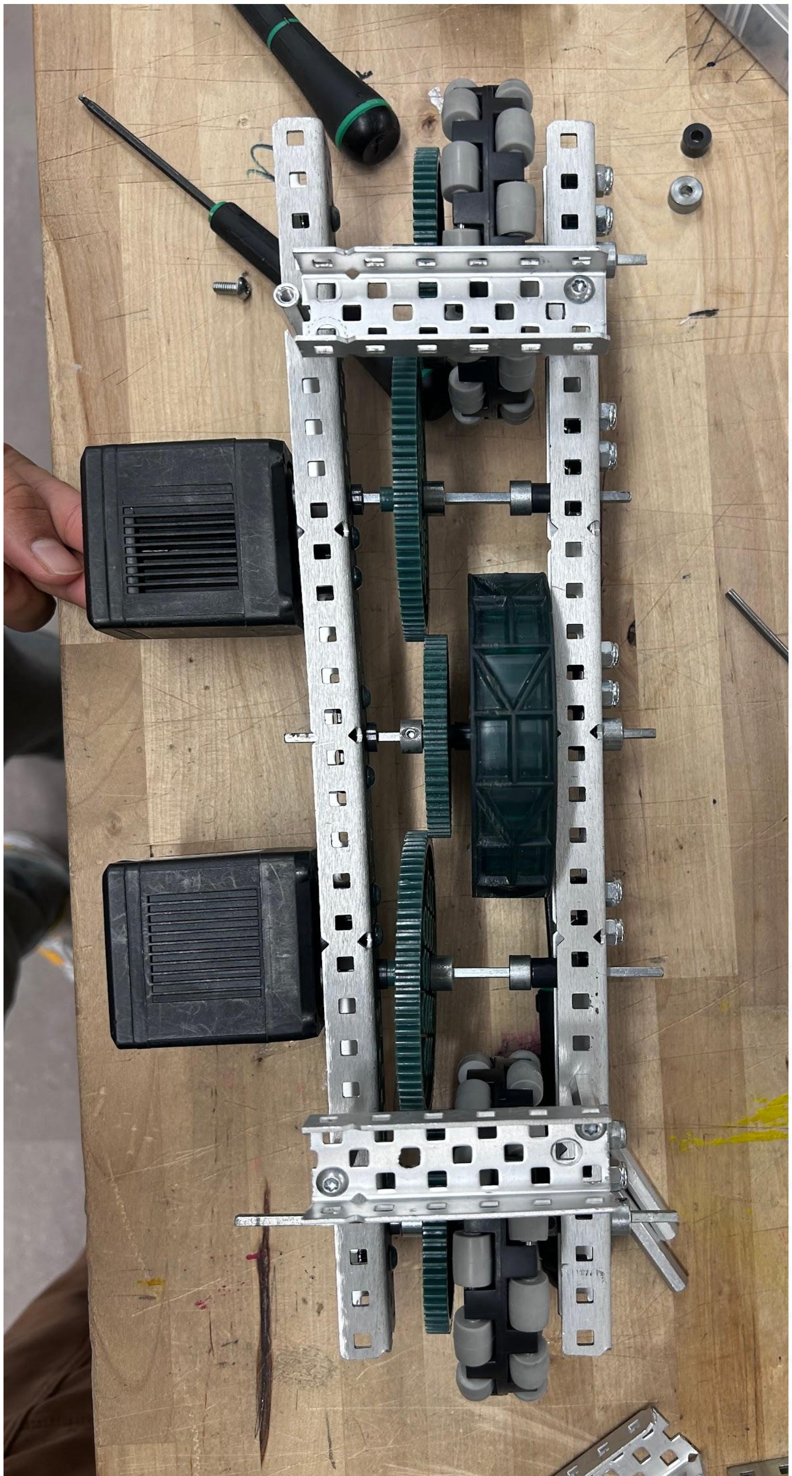
We built these wheel pods using:

- 2 C-channels
- 6 small gears
- 4 big gears
- 4 Omni-directional wheels
- 2 traction wheels
- Medium/Small sized axles
- 4 motors
- 10 Shaft collars

The small gears are placed at the ends and middle of each C-channel, held in place with small axles. Big gears are placed between them held in place by small axles. The shaft collars keep the axles from falling off the other side. The wheels are placed in on the small gears with the traction wheels in the middle.

We chose this version and model for the drivetrain. The gear ratio is 3 is to 2 . we are using 4 , 200 rom green motors. With this gear ratio and these motors, our drivetrain will be moving at 300 rpm total. This drivetrain is good for us because we wanted to focus on speed but we also did not want to lose torque. Other teams went with 600 rpm which is way too fast and 450 is decent but has less torque. Having a good torque allows us to not be pushed around. We also have 2 traction wheels which are also for the same purpose. The traction wheels also allow us to make our auton easier as it helps to negate any drift cause by the 4 omni wheels. With the traction wheels and the inertial sensor on the drive train, we are able to minimize the drift to about 2 degrees. Having this rpm is still fast and not slow by any means. With the added torque as a bonus, we are able to push around other robots. We are also able to hold onto the positive corner and play defense as the torque and the added friction from the tractions wheels make it really hard for teams to pull us out of the corner. This allows us to play really good defense. The drive velocity also helps us in skills driving as we need to be kinda slow and precise. This drivetrain is way better than our first build as it is faster and geared better and the overall structure is better. Our drivetrain was way too small last time so i think we are satisfied and happy with the one we have now. We also made it really low friction so that it able to move freely.

Current Progress:



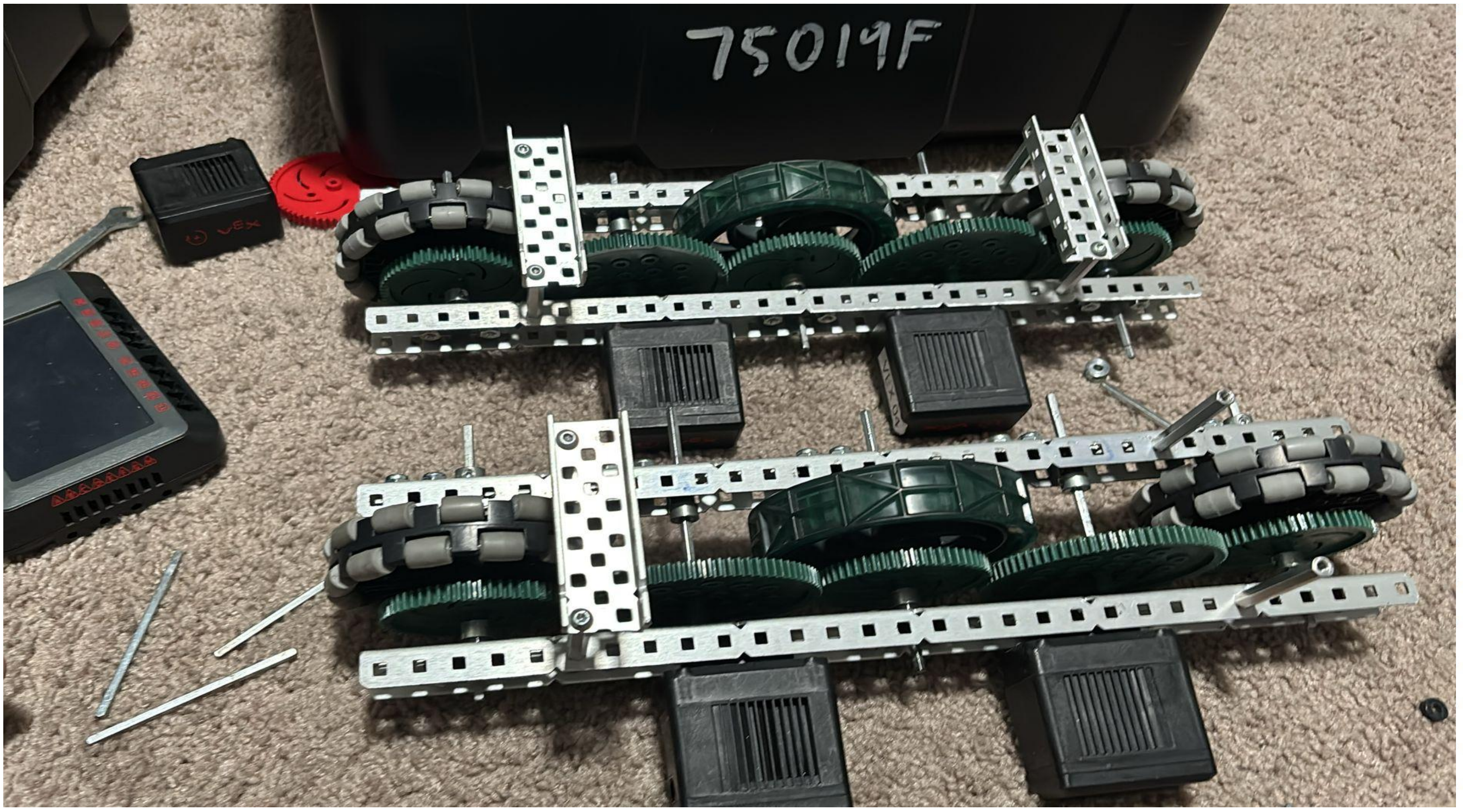
Our builders have completed one full wheels pods. This is basically just a prototype because we want to test out the wheel speed before completely screwing and securing the gears and wheels in place.

We have the motors on the outside because that makes the wheel pods smaller since the motors will just occupy the empty space in between the wheel pods when we connect them.

The cut C-channels on the top are mainly used for support to hold it together, but also give us the possibly off build upon the wheels as well as another optional spot to pull the intake at a raised position.

Project Completed Wheel Pods

Current Progress:



Shiva is our primary builder, so he takes the robot home on weekends to make progress.
He took the robotics kit home and built the second wheel pods because we were able to finish the first one during the after school lab work days.
We gathered the parts required to put it together and placed it in a separate container, so he has easier access to it. He used the original wheel pods with the documentation progress pictures to replicate it.

Issues and Challenges with DriveTrain:

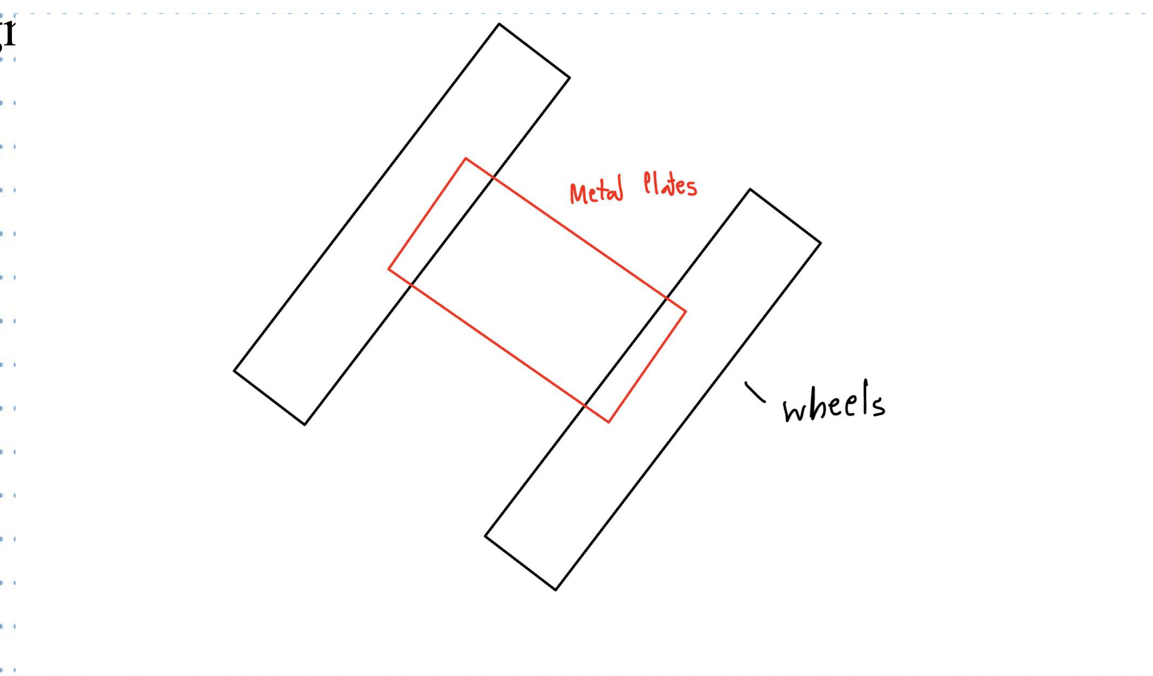
1. When building the wheels pods, the biggest problem was finding the exact same sizes of pieces, so each side has the same dimensions and weight for greater overall balance on the robot.
2. When building, we first tried to find the right ratio of gears to make sure they connect. This caused them to fall the C-channels since we didn't want to waste time by screwing down the gears and continuously switching them out. We fixed this by adding the axles so that they couldn't fall off the C-channel even if we picked up the whole thing.
3. The main challenge with the metal was finding 4 same size and material C-channels. The majority of C-channels are either cut or different materials because the aluminum c-channels are heavier than normals ones, which will cause a balancing issue. This could lead to the wheels leaning towards one side, messing up the direction it moves and causing steering difficulty.
4. Another issue was the pieces we chose to use. The star screws are easier to screw in place, but fall off easier. We used these at first, so after testing the wheel rotation speed, they began to loosen or fall off. Shiva replaced these with the unlock rubber nuts. They are harder to attach, but rarely ever fall off, giving the drive train gear system more stability. Also requires less maintenance and less adjusting back into place.

Now that we have both drive train wheel parts, it's time to connect them. We have decided on a couple ideas to implement this.

Option 1:

- Connect the wheels together by adding 2 metal pieces in the middle. One on top and one on bottom.
  - This adds more support and stability so they don't shake and makes sure that 1 side isn't higher than the other.
  - Keeps the front and back sections open, so we have free use to make the intake and stand for stake.
  - The middle plates can be used to store the battery and brain since it's the center of the robot.

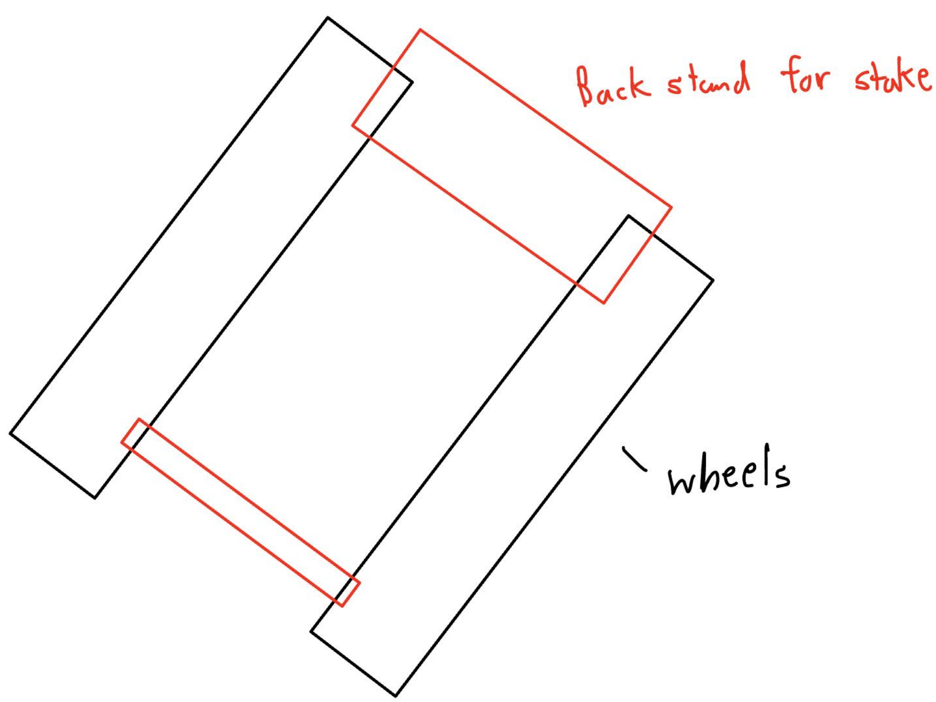
Design



Option 2:

- We use the back plate (the one intended as the stakeholder) as part of the connecter pieces by refortifying to be stronger.
  - This allows us to keep the middle space more empty, so we can make the conveyor belt and other hovering mechanics have more space and be lower. Ensuring that we don't exceed the maximum height and can still go under the middle tower.
  - Prevents battery from being in middle, which is a hard to reach place.

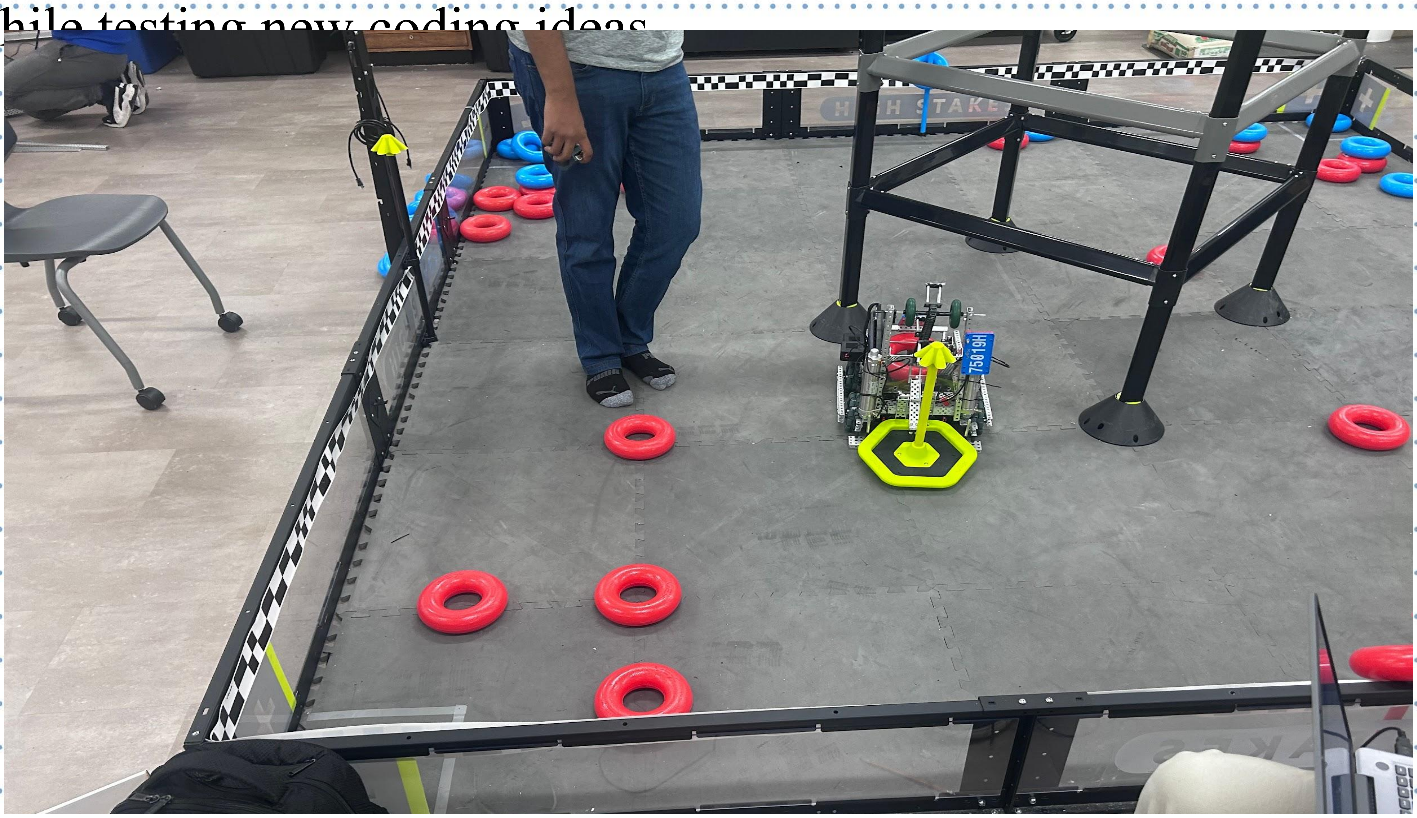
Design:



Our team as voted to go with option 2 because it has more cons than pro since our strategy relies on being able to move more freely around the field, including going underneath the tower in the center. We also wanted to place the brain at a higher place. This allows easier access to pressing buttons on it and changing settings as well as replace the battery when it gets low.

We plan to start it next time we meet up as we frequently take the robot home to have additional time to make progress since the state competition is only a few weeks away.

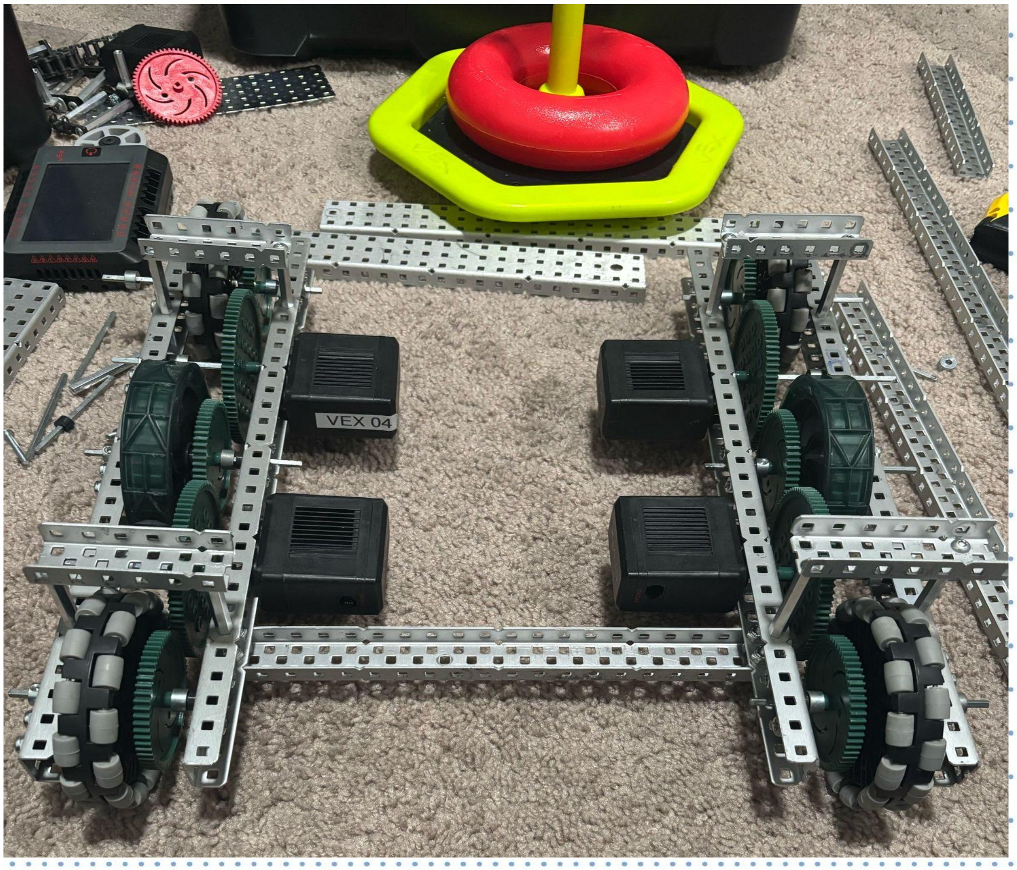
Arnav is still working with the old robot and planning out auton, while testing new coding ideas.



Project Drivetrain Decision

Name AutoBots Date 2/11/25

Shiva took the robot home and added the connector pieces to the wheels.



As shown in the photo, he has added the connector piece in the front and has started the layout for the back piece.

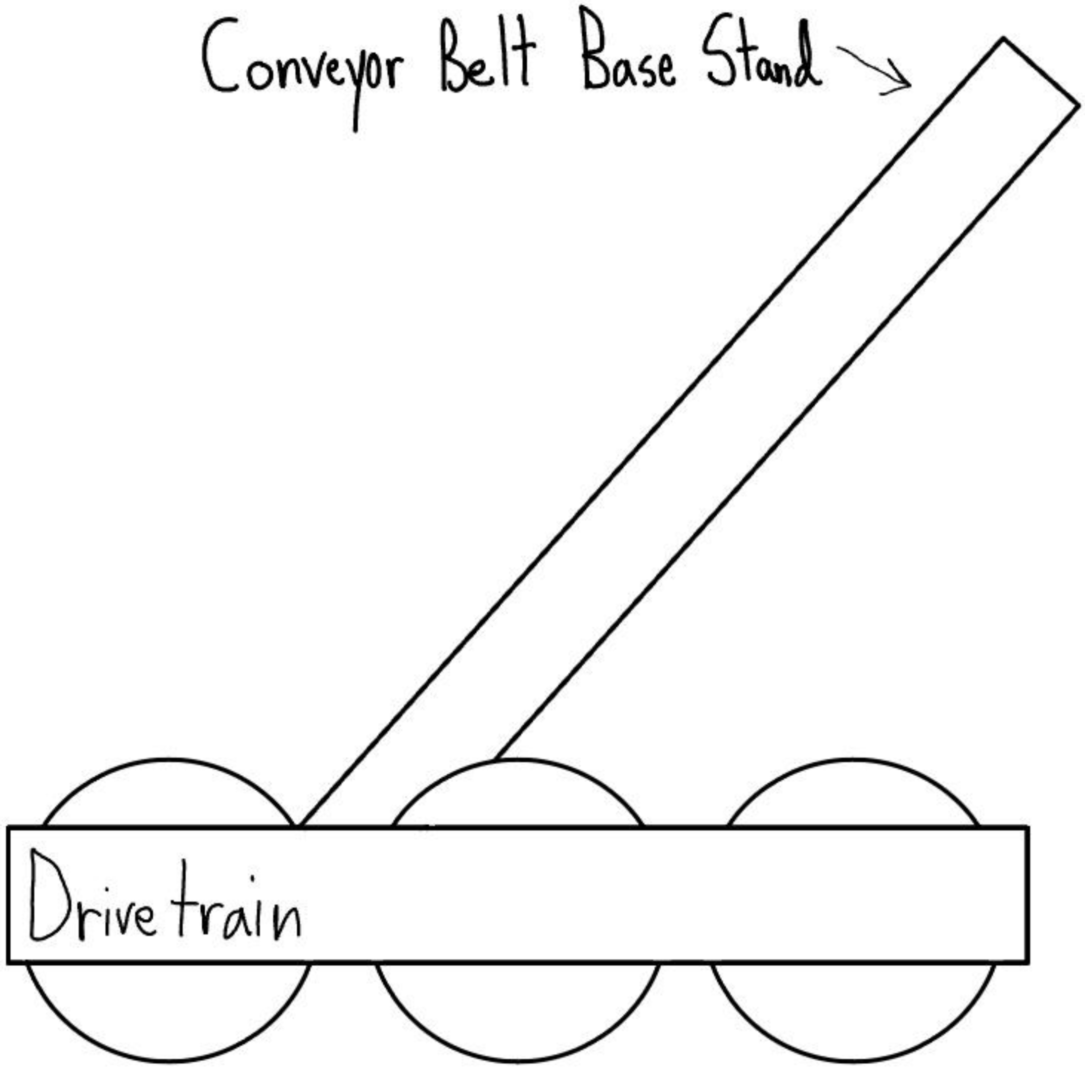
There 2 because the first one connects the wheels and the second expands that base for the stake to sit on.

On top of each wheel section is a cut c-channel to add further structural stability to the wheels and decreases the already low chance of them collapsing and falling apart.
He added them to the front side and back. They are also intended to be used as foundation pieces to build upon. We are considering putting the intake on there since it we need to elevate the intake anway

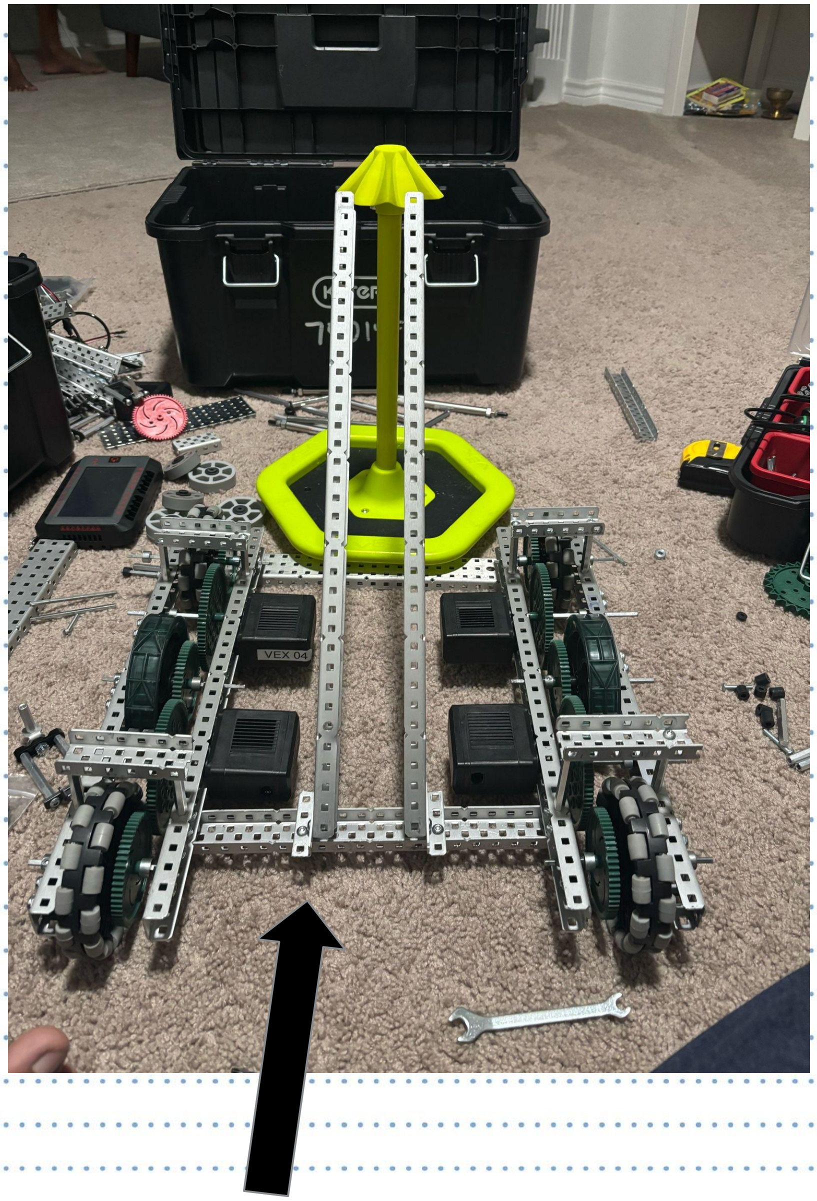
Conveyor Belt

Shiva and Neerav have chosen to to make the conveyor belt not require 2 vertical C-channels at the back to support the top of the conveyor belt pieces.

Initial Design:



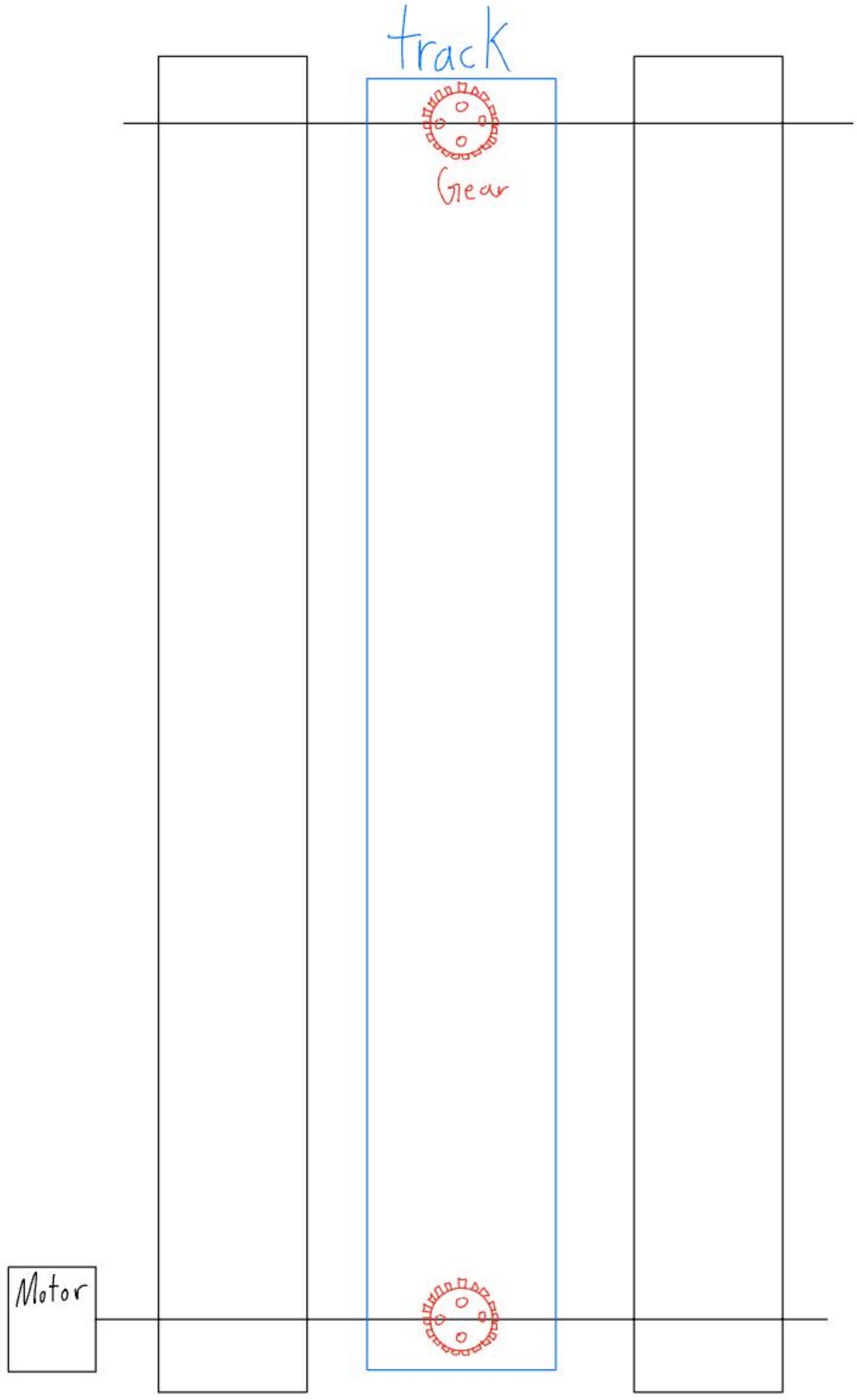
Prototype:



Our builders used C-channels placed diagonally to be the frame of the conveyor belt. The actual track will run through the middle of those to stands.

The motor will be placed near the bottom to keep the weight centralized. This will also prevent the robot from tipping over backward if the motor was placed at the top of the conveyor belt.

These are the pieces that hold the c-channels in place. Those small metal plates secure the stands down and make sure they stay and the right angle.


track
Gear
Motor

On the page earlier, is our first blueprint of the conveyor system. It's just a rough sketch of the style we want to implement.

We are going to use a motor that is a 600 rpm blue motor, which is going to be connected to the direct drive of the conveyor belt which is 3 times faster than the old bot. This means its 300% better as it will rotate faster and more efficiently since we are using a better motor.

In the design, an axle running through the motor is holding the conveyor belt tract on so that it rotates with the motor. An axle is secured at the top of the conveyor belt stands where the peak of the tract reaches to ensure it stays in place as it rotates.

They used the thin axles because the thick ones can't handle the faster speeds since the hole in the motor to hold them isn't as deep. The c-channels also have to be drilled to fit a thick axle.

The motor is placed on the bottom of the conveyor belt stand on the left but is not directly connected or touching the drive train.

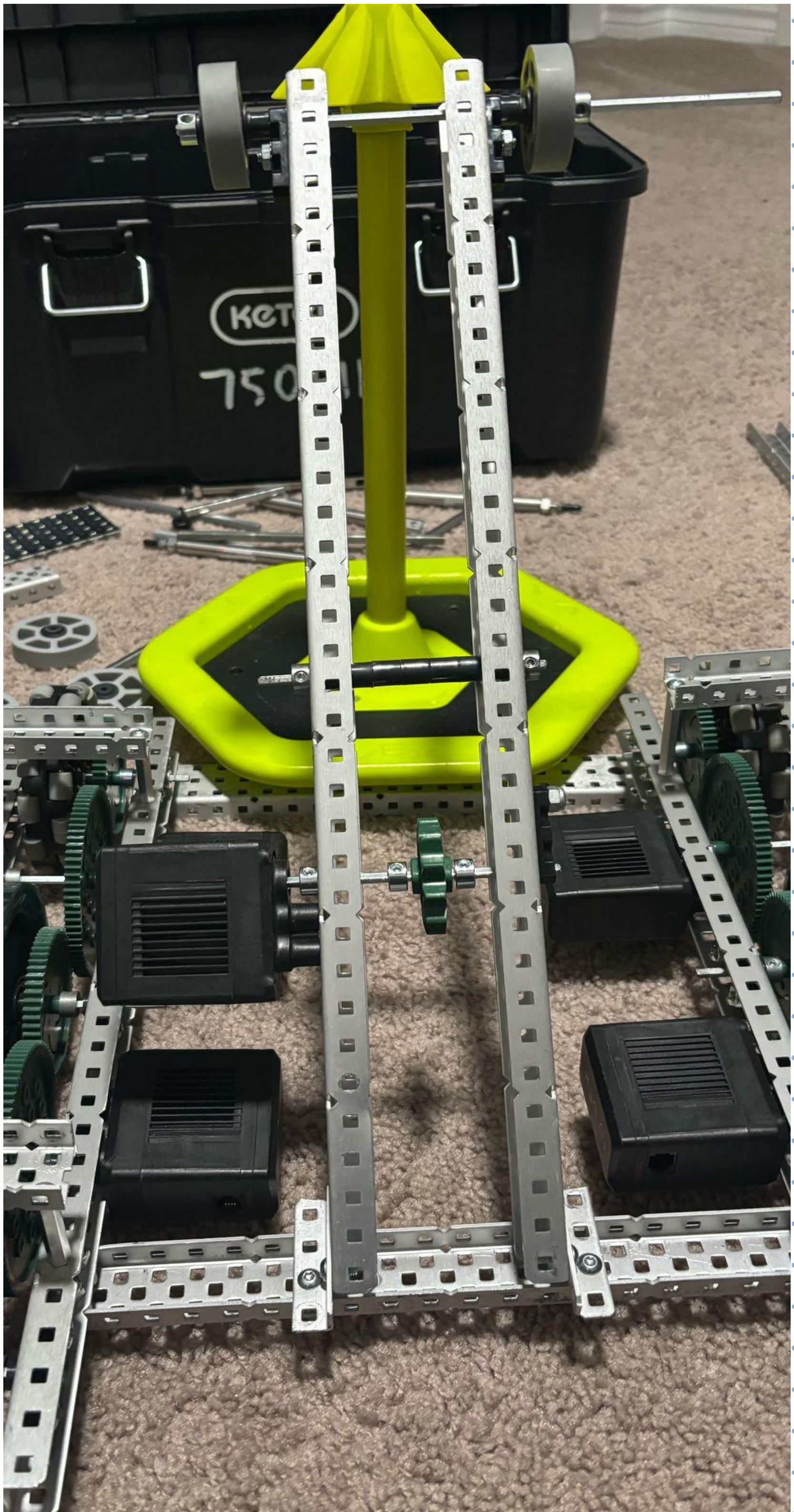
Neerav placed it at the bottom of the conveyor belt, not just to account for the weights balance, but to also leave space at the top for the wall high stake mechanism to rest.

This is our conveyor belts track. We used the thing ones because that allows us to make the space between the conveyors stands smaller.

To hold the hooks we added individual pieces of the bigger track that contain screw holes.

The hooks are made up of screws, standoffs and poly-carb. The standoffs are screw down and then polycarb is placed on top. The polycarb pieces are created by accurately cutting it off a big sheet of clear polycarb.

We measure the height of the rings to decide the length of it and the curved ends have tested better to have a increased consistency of holding the rings instead of them getting stuck in the intake or falling off before falling onto the stake.

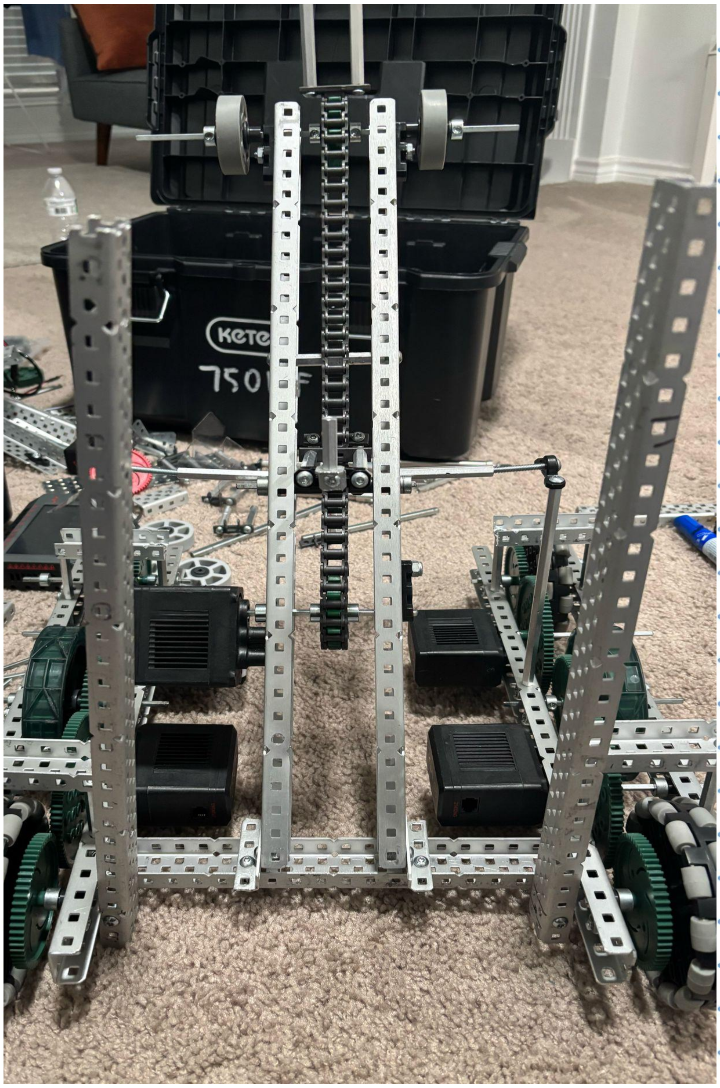


The picture contains the axles, motor and gear that we had already planned to add as it was seen in the blueprint.

On the axle, on the outsides of the conveyor belt stand are flex wheels. These are what help guide the ring onto the stake.

The ring just rides up the tract to the top, but that's where the flex wheels come in handy. Since they rotate with the axle, once the rings reaches them, they guide the ring onto the stake. The flex wheels cause the ring to rotate down onto the stake with ease due to the friction caused by the material of the wheels.

They also added that black piece in the middle for support and to help guide the tract up.



In this photo, we have added the conveyor belts tract with the original idea for the hooks on the ring.

It uses a standoff to hook onto the rings. This proved inefficient because it couldn't consistently hold the rings on it.

They are also thin, causing the ring to move side to side as it goes up the tract.

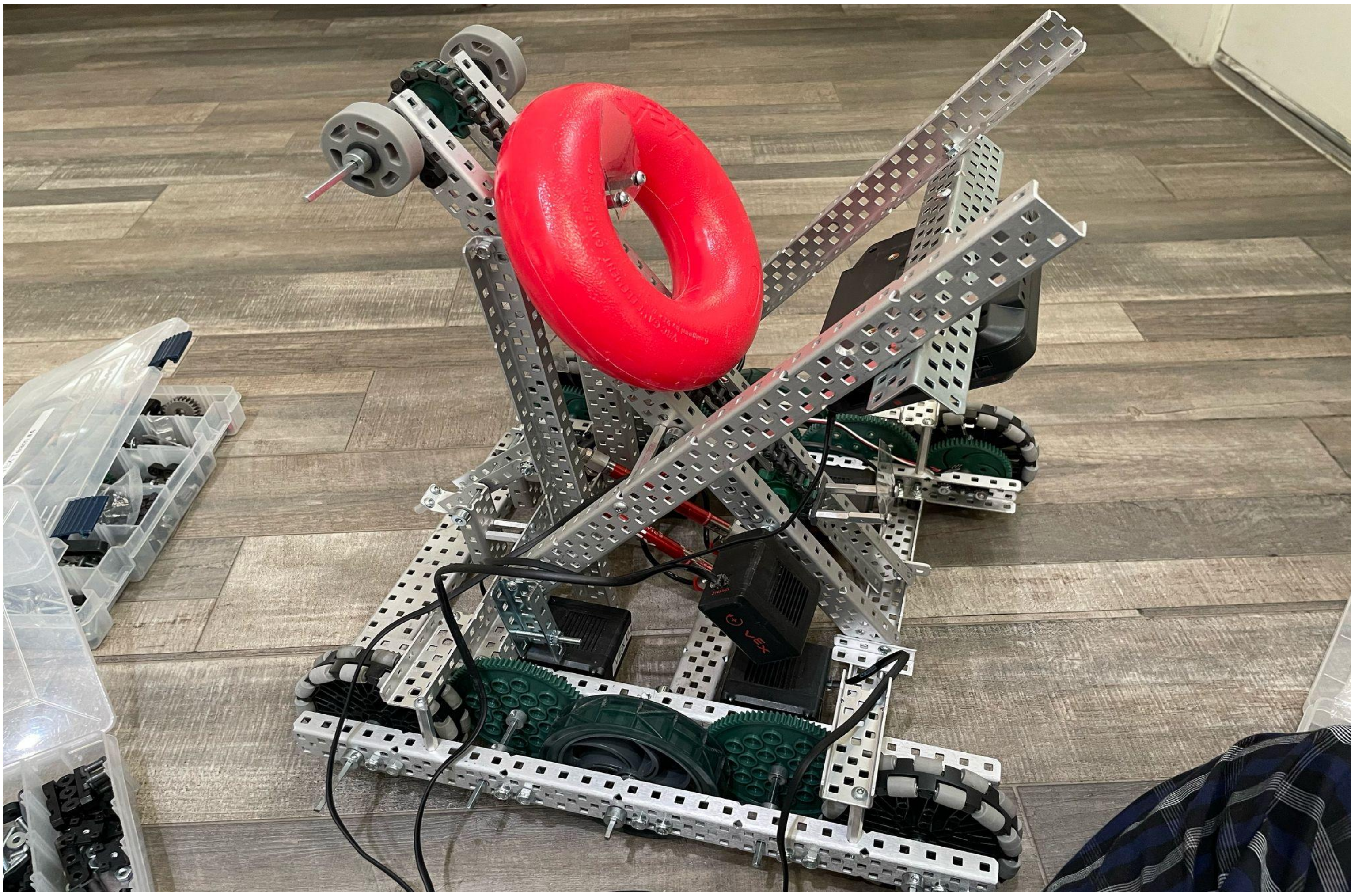
The end is rounded and has to friction. This means that the ring won't land on the stake everytime as there is a chance of the ring flying off the conveyor belt when it reaches the top.

Since the stands were still swaying a bit when we accelerate the axles faster, we added pieces to the sides to add further support. Each side has a standoff connected to the stands while being held up with standoffs.

These hooks are created by using bent metal to create a right angle to grab the ring as it goes up an intake.

Project Conveyor Belt

Name AutoBots Date 2/16/25



This is the current progress of our conveyor belt. We added 2 more diagonal c-channels facing the opposite. This is to provide more support to the conveyor belt.
We also plan to build the high stake arm on the second set of stands facing the other way.
As you can see in the image, we are using the polycarb hooks which are consistently grabbing the rings and do not fall off as they go up the conveyor belt.
We can operate it at any speed necessary as it has 2 standoffs and 4 c-channels that are providing stability to keep it skill as it rotates.

Issues and Challenges with Conveyor Belt:

1. The biggest challenge was creating the conveyor belts tract hooks. They have to be the right size and shape to make sure the ring doesn't fall off or shake as it rides up the track at high velocities. The material also made a difference as they have different textures. The metal was more rounded and thinner, but the clear polycarb was more rigid, smooth and flat. It was the overall better choice as it had more consistency in keeping the ring safe to the stake.
2. Another issue was the stability. During the conveyor belts earliest testing, we observed shaking and wombling of the stands as it rotated quickly. We fixed this by adding 4 more stands and 2 standoffs on the sides. These stands, which are c-channels, are also useful to placing other things with them.

Overall, these were the 2 biggest challenges paired with a couple minor issues. We solved these as a team why sharing and combining ideas as we researched other robots and their take on the problem.

Shiva decided to add the stands and standoffs for more support, but it was Neerav's idea to make it a place for the wall high stake mechanism.

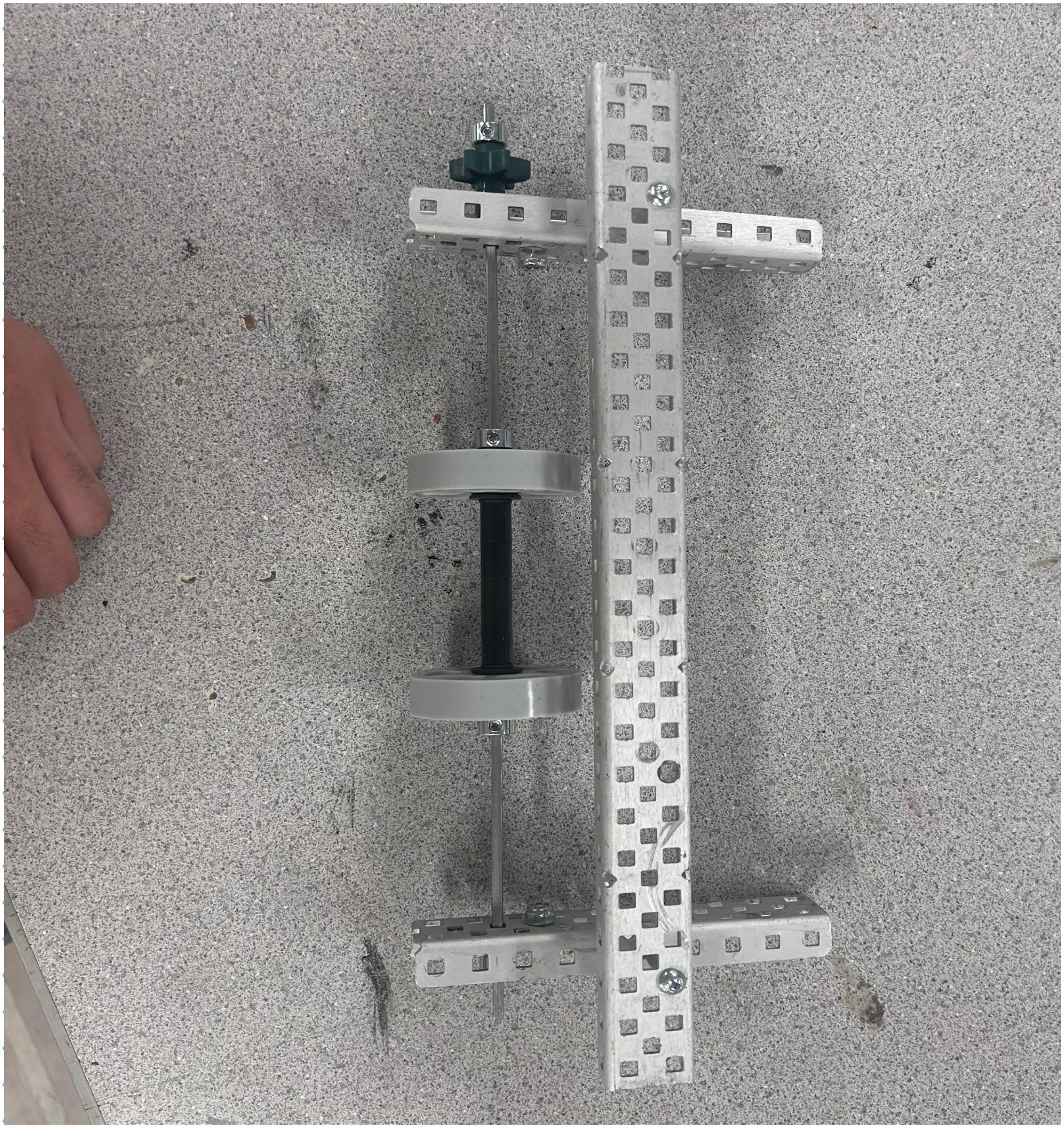
Final Product:
Added a c-channel to rest the brain on for easy access.

Project Conveyor Belt Complete

Intake

For the intake, we decided to go with something similar to our old robot, but with a couple of tweaks.

Here is the base model:



In the page above is the base model of our intake. We wanted to start with something somewhat operational to test it out and see what to change and what can be improved

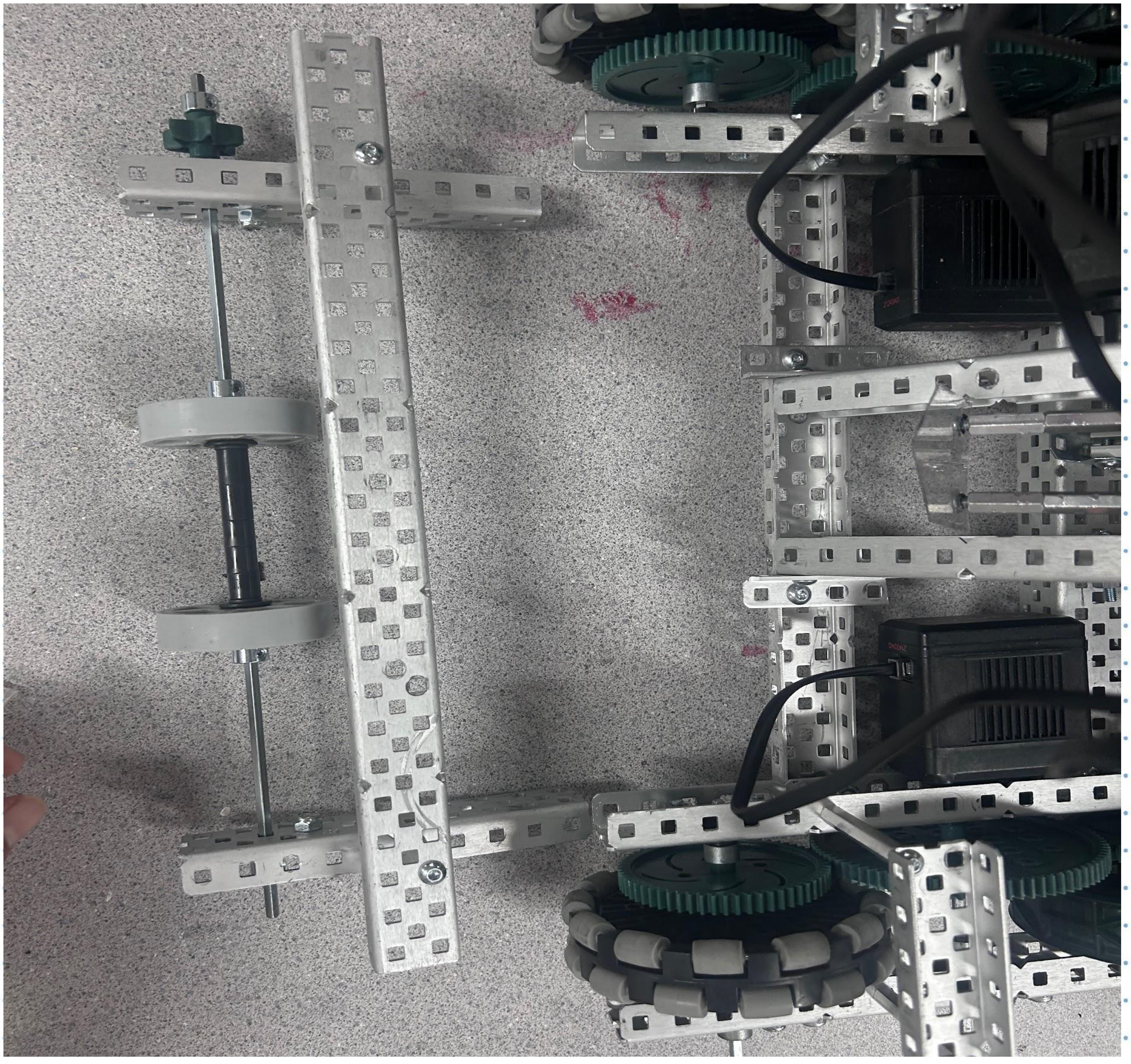
Ideas:

- More Flex Wheels
    - Easier for ring to slide on.
- Spin at higher speeds
    - Add a gear system for a higher speed.

On our old robot, the intake wasn't always a 100% consistent and sometimes stopped working good.

We want to change this a different flex wheel set up as well as adding an improved gear system to increase the speed but keep it at a smooth speed.

This is where we plan to place the intake. This is the front of the robot at you can see where the conveyor belt is going to intercept the ring.
The green gear has been added there to use for a gear system, which will be devised in the future.

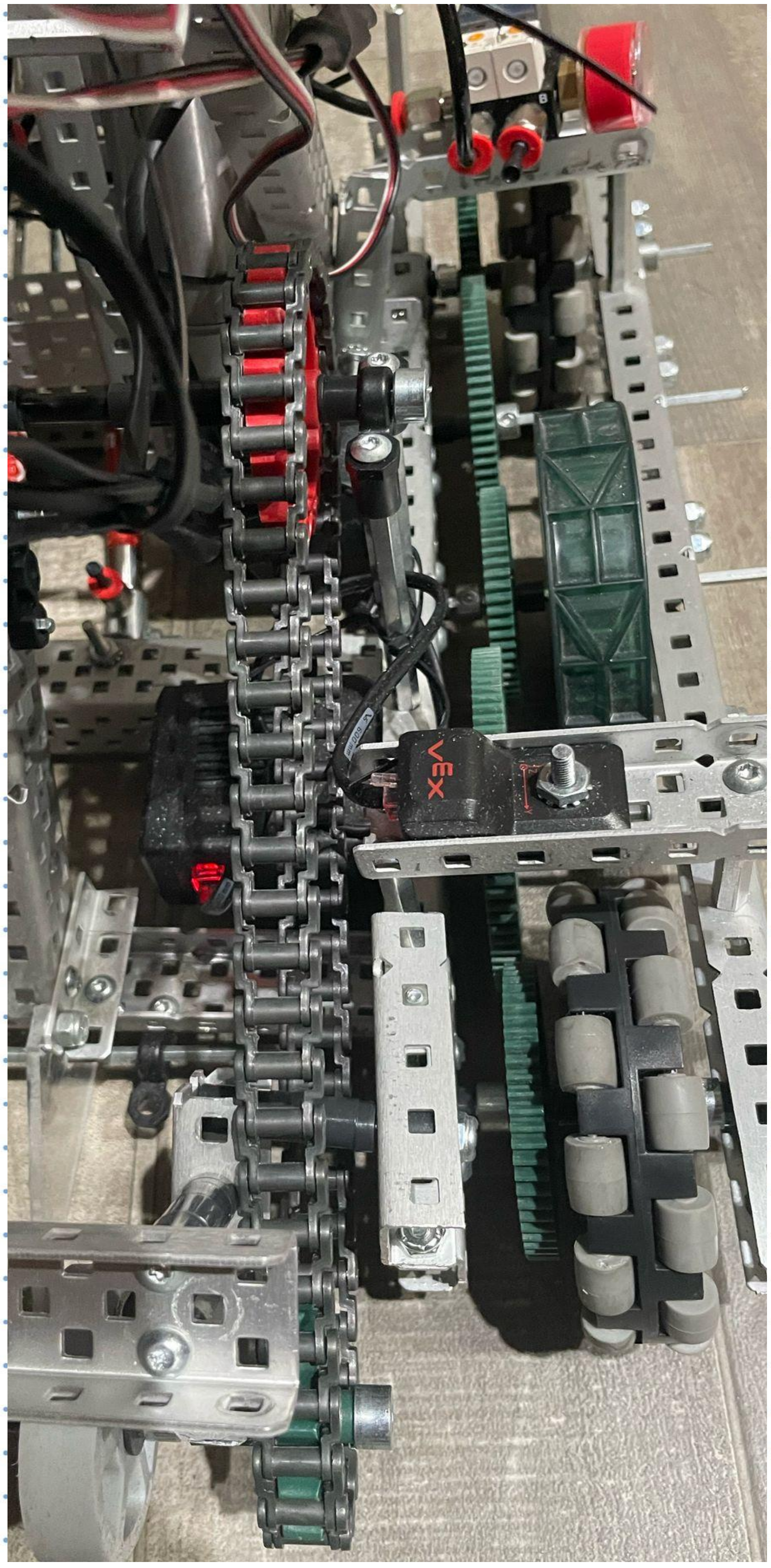


Current Progress:

We added more flex wheels to the sides for better grip. Our builders chose to leave the middle empty because then the ring doesn't waste a second going up by being stopped in the middle of the ring. When a ring comes in contact the front keeps going and the sides eventually slow down as they reached the flex wheels and are guided up. This process takes longer with center wheels because then it starts earlier when the front middle of a ring comes in contact the second we start moving at it.

Both ways work, but this one should be more efficient as it makes the full process a few seconds faster.

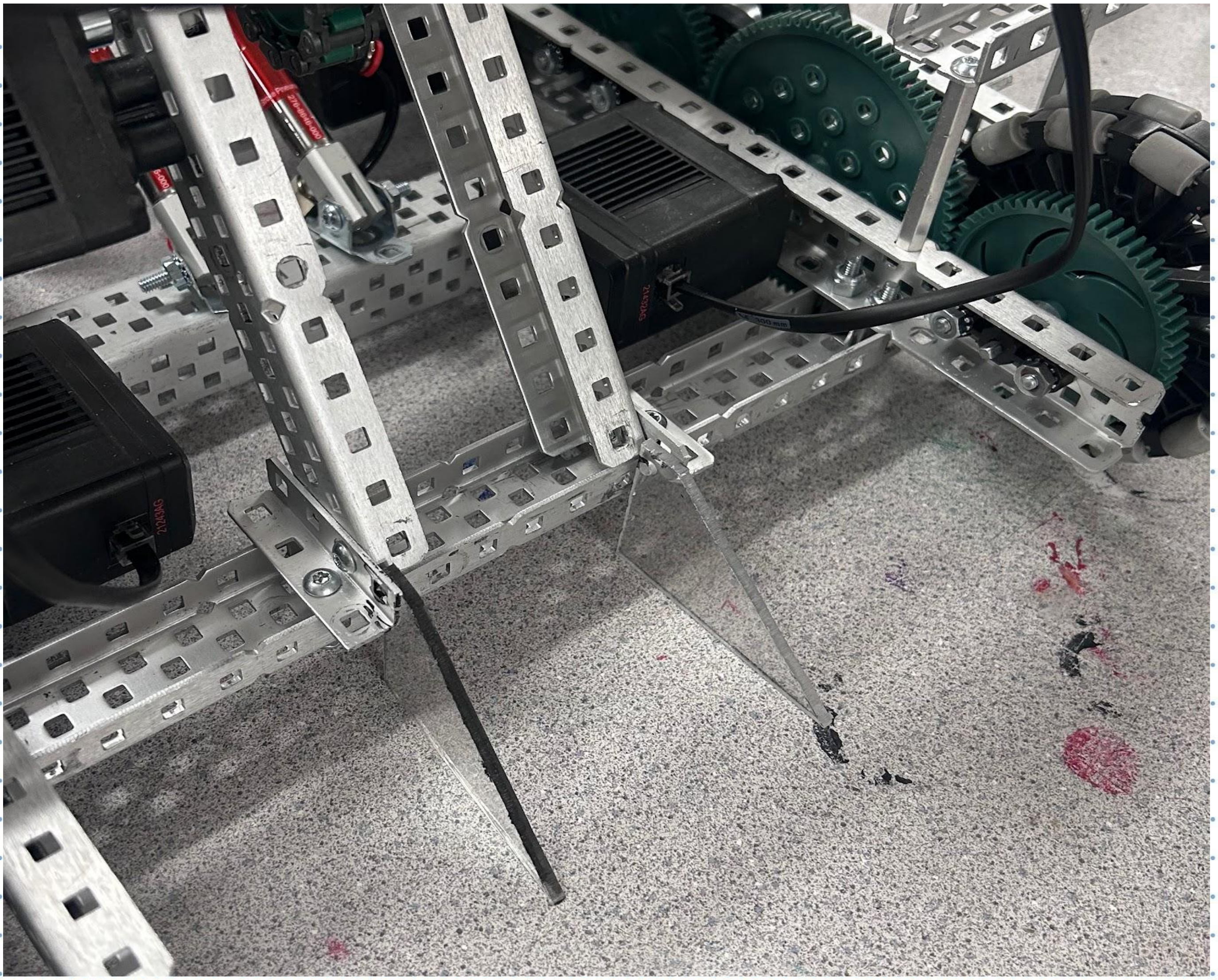
Gear System:



This is our gear system. The motor is placed up higher than the intake place because there wasn't a good amount of space. It could take damage from other robots during the tournament if it gets hit.

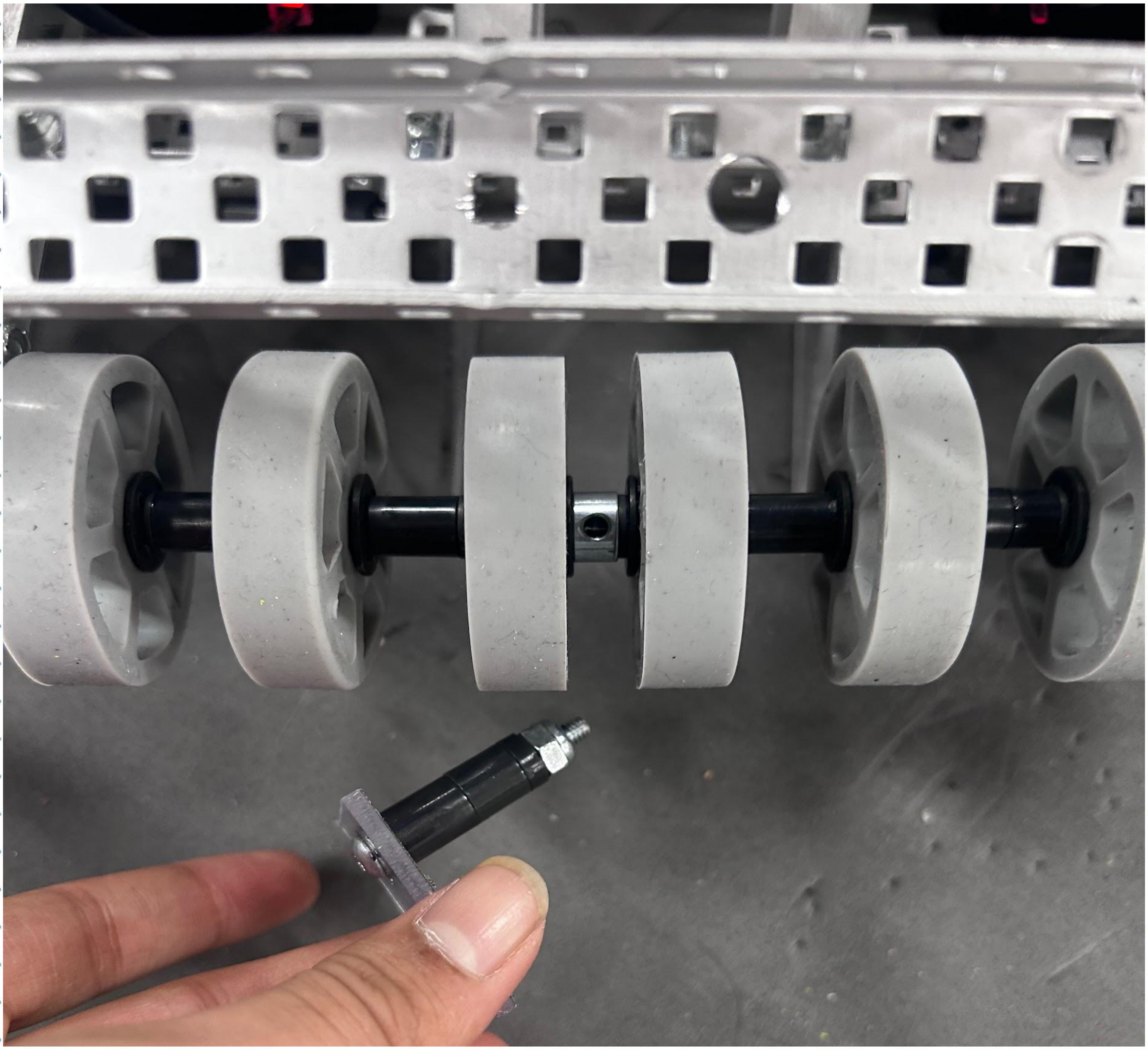
The red gear is placed on an axle and spaced out with spacers, while being held in palace with nylock nuts.

It's connected to the intake by a track piece that spins the red gear and the green gear on the other side of the track



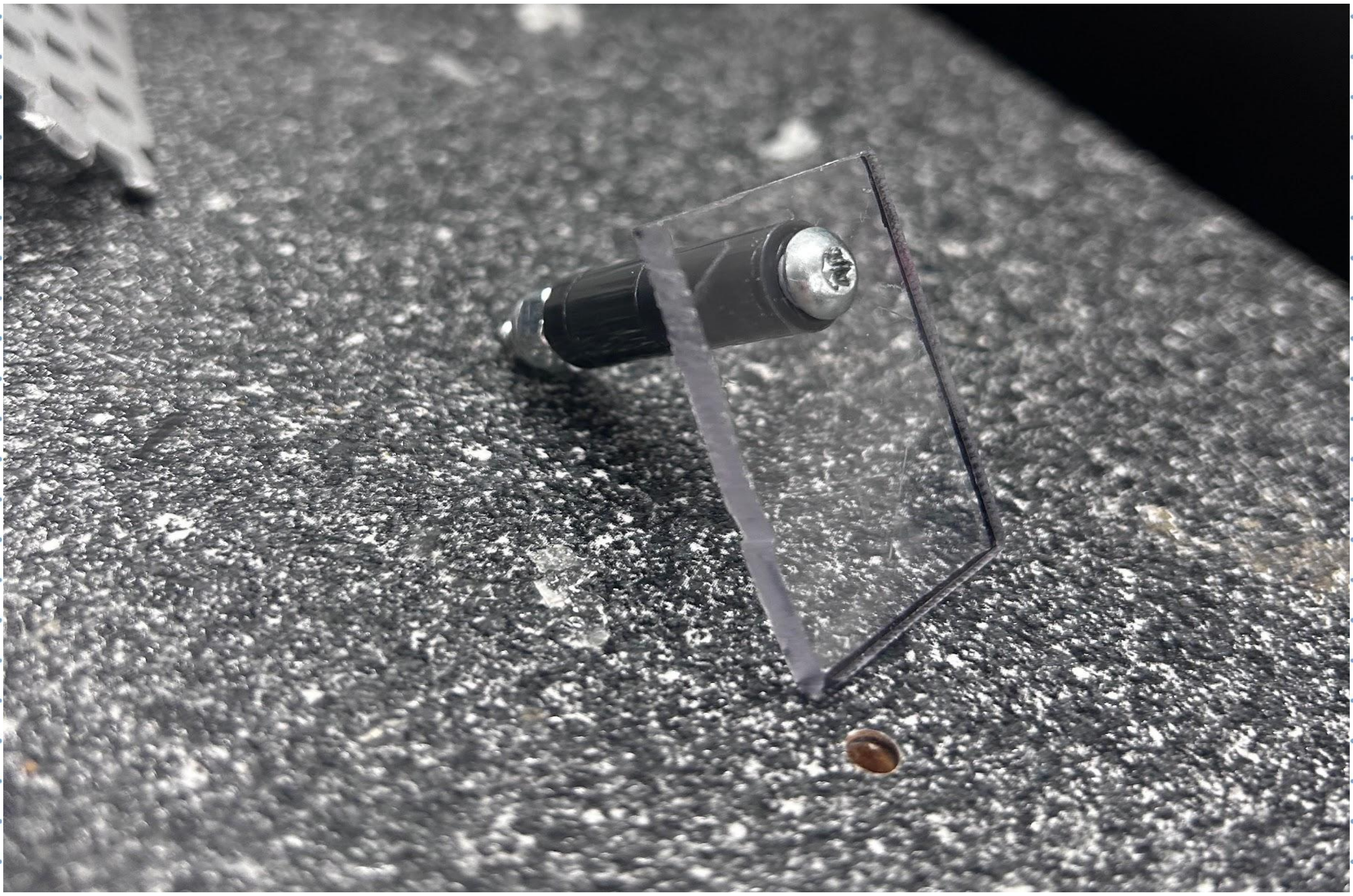
This is our ramp for rings to go up as they go in the intake, onto the conveyor belt. It’s made up of polycarbonate cut to our desired size. It removes the need for an unnecessary piece going across the open space.

Our old robot used a full sheet, which worked just as well, but was not required. This new ramp style takes rings from all angles and the intake slides it over to the main part of the ramp smoothly as it goes up.



This the final intake design with wheels all across. We ran tests with the more completed robot and its style suits a fully covered intake.

The piece I'm holding is a unique design Shiva came up with to use on our intake.



This is our original unique design. It was created to make our intake more efficient. On the earlier page, you can see where I'm holding it and its place on the intake. Once it's placed there and comes in contact with a ring, it forces the ring up the conveyor belt much faster than previously. The flex wheels bring the wheel to the center to reach this piece and help guide and roll it up into the conveyor belt. The greatest part about this part is that it minimizes the use of the intake as it forces the ring up in 1 rotation. This piece allows us to get rings up repeated and more than 1 at a time since it takes 1 rotation to rise up to the conveyor belt.

Issues and Challenges with Intake:

1. The greatest challenge to creating the intake was creating the axle with wheels. This is the part that actually brings the ring. As you saw on the earlier recorded pages, our team has tried multiple variations of flx wheel alignment.

- 2 wheel formation
- 4 wheel formation
- 5 wheel formation
- 6 wheel formation
- 6 wheel formation with special piece

These are the variations we ran through and we have discovered that six wheel with special piece has the best results.

It had the most consistency as well as the most efficiency since the special piece makes it take 1 rotation for the ring to go up.

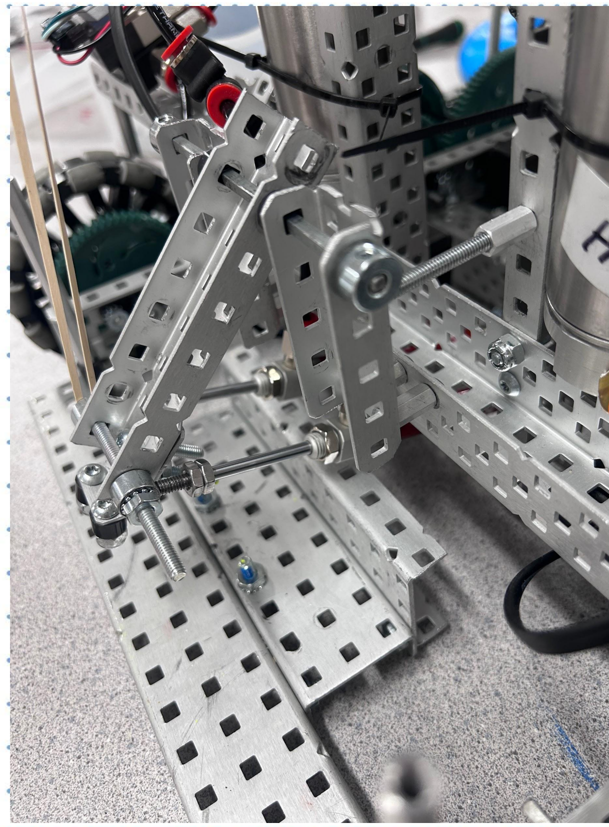
Pneumatics

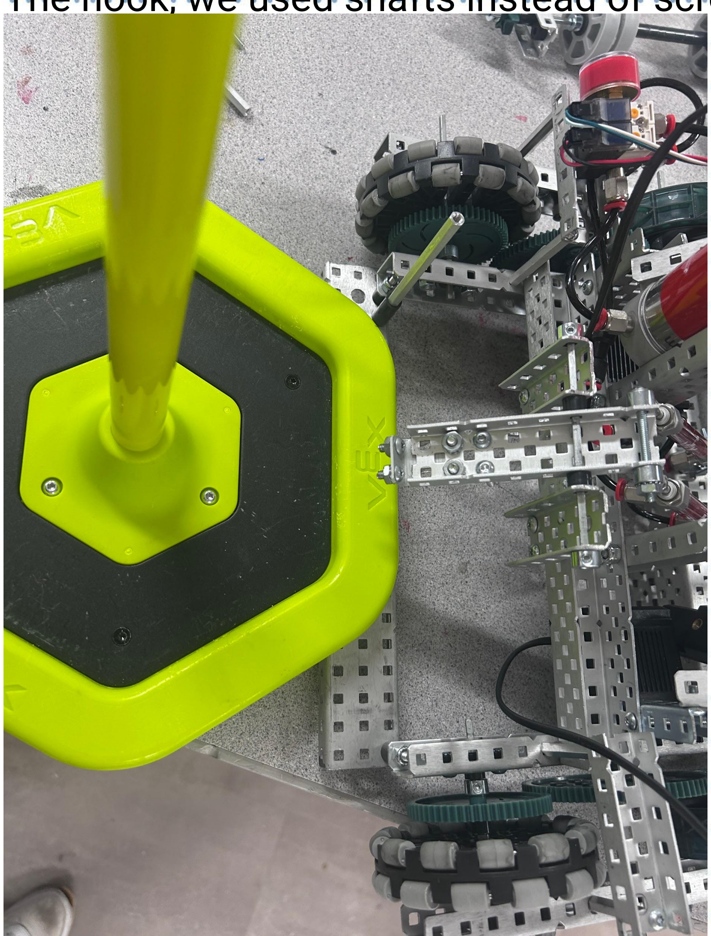
On our previous robot we used on piston for our goal clamp. Although it was strong to pull in the stake. The stake was still able to wobble a lot. On our new robot we decided to position our C channel further down to grab on to the stake easily and quickly.

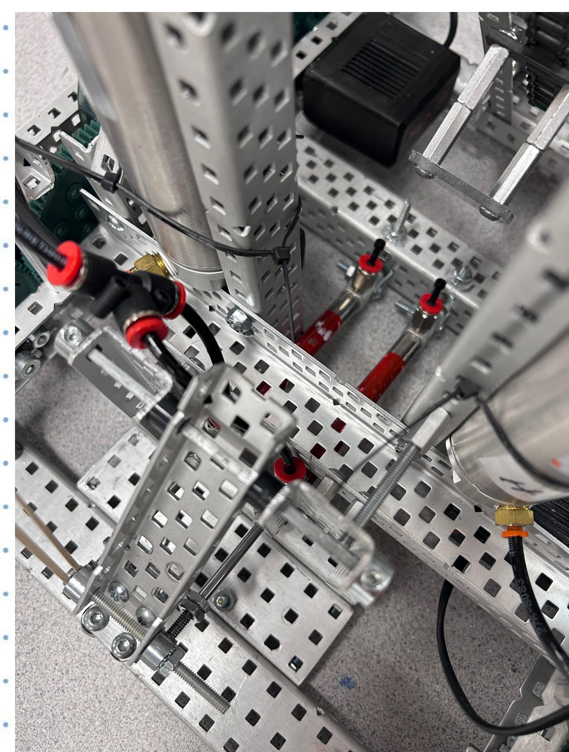
We also used Two pistons this time to get more pulling strength. This meant that the stake will be really stable and allow rings to pass through constantly. In order for the stake to not completely go in side the robot. We attached a C channel on its side to act as a barrier or a wall to prevent the stake from entering the insides of the robot Since we got access to the new pneumatics, We are able to conserve a lot of air unlike the old pneumatics. The new pneumatics also prevent air leaks. On our old robot we had a lot of air leaks and that's why we had constantly fill up the air tanks during regionals.

The new solenoids and pistons make it really easy to use pneumatics Because there are more options to connect different tubes to the tank. To conserver even more air, we decided to make the pistons one-way instead of the normal two-way. One way pistons can be configured to either push but not pull or pull but not push. We decided to pull the pistons when the B button is pressed and when pressed again, we used rubber bands to pull the hook back to its original state. This is really efficient because for alliance matches we need all that to grab and let go of stakes

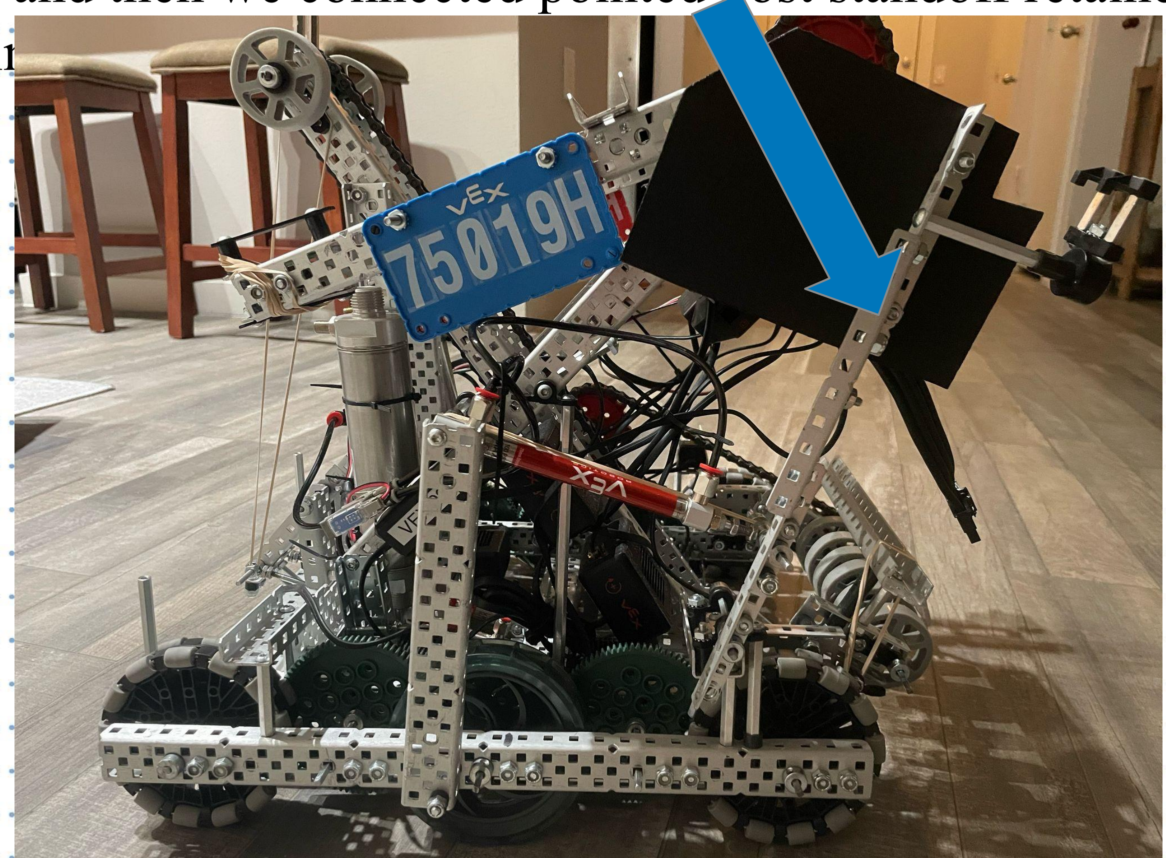
As you can see in the images shown below
We have used two pistons that are connected
To the goal clamp and provide more pulling
Strength. An important component of our
Goal clamp mechanism is the aligners. The
Aligners are used to align the stake when
We drive back into it. No matter what position
The stake is in, the aligners always perfectly
Get the stake into the alignment we want it to
Be in. The way we made our pistons one-way
Is by closing off the one of the two fittings on
The piston. To make smooth movement of
The hook, we used shafts instead of screws



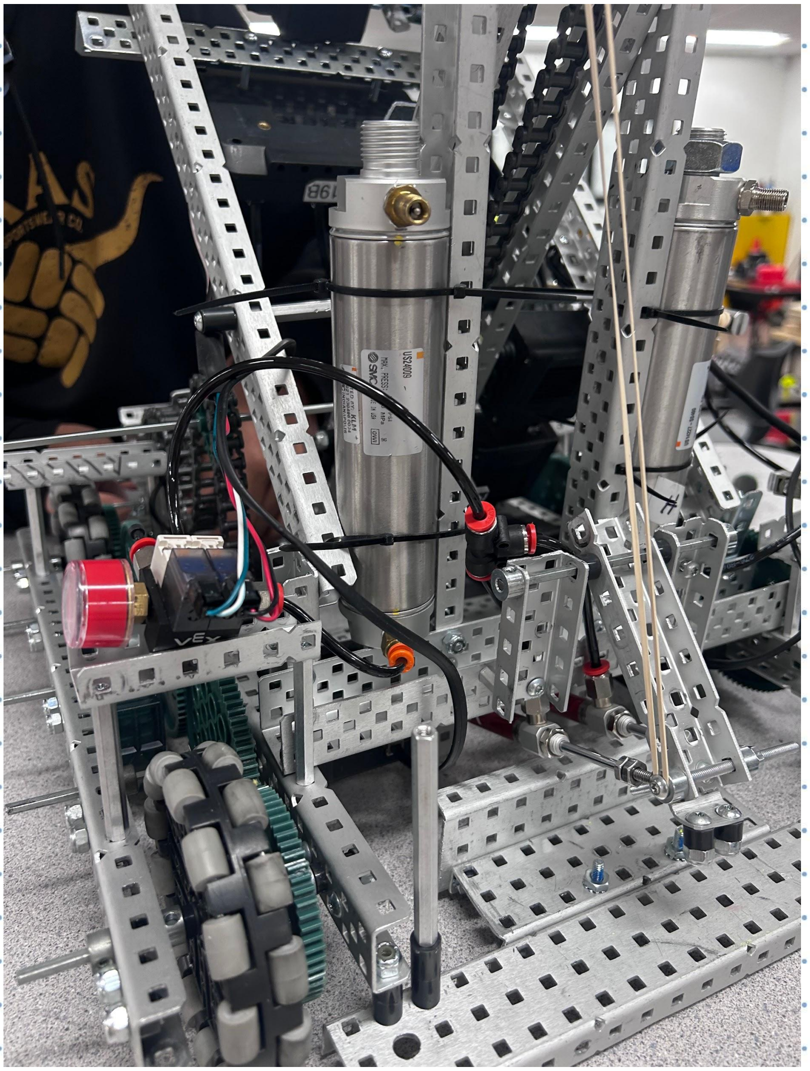




We were always thinking of ways to get to the stakes faster without using the goal clamp. While researching, we came across the "Doinker". The doinker is a really good system to rush the stakes and take them before the other teams can. We used a single two-way piston to run the doinker. The piston is angled in way so that doinker can be push down to the ground. We used L channels to create "arm" like structure of the doinker. We then connected shafts/axels to those L channels to make smooth movements when the doinker is moving up or down. In onder to actually grab the stake, We decided that it's easier to grab the stake from the bottom and drag it along with us. To do that, we had to use a medium size standoff pointing down and then we connected pointed post standoff retainers that act like ti



Project Pneumatics - Doinker



The way we connected our pneumatics is through the new fittings. We used T fittings to connect the two pistons to the goal clamp. Angled fittings were also really use because they made it easy to connect tubing. We ziptied the pneumatic air tanks to the C channels that are connected to the belt. After that, we interconnected the tanks so that they share air which increases the overall PSI limit. Because we won't use the doinker much, it won’t need its own air tank. So the best option was to connect the tanks together to efficiently use air.

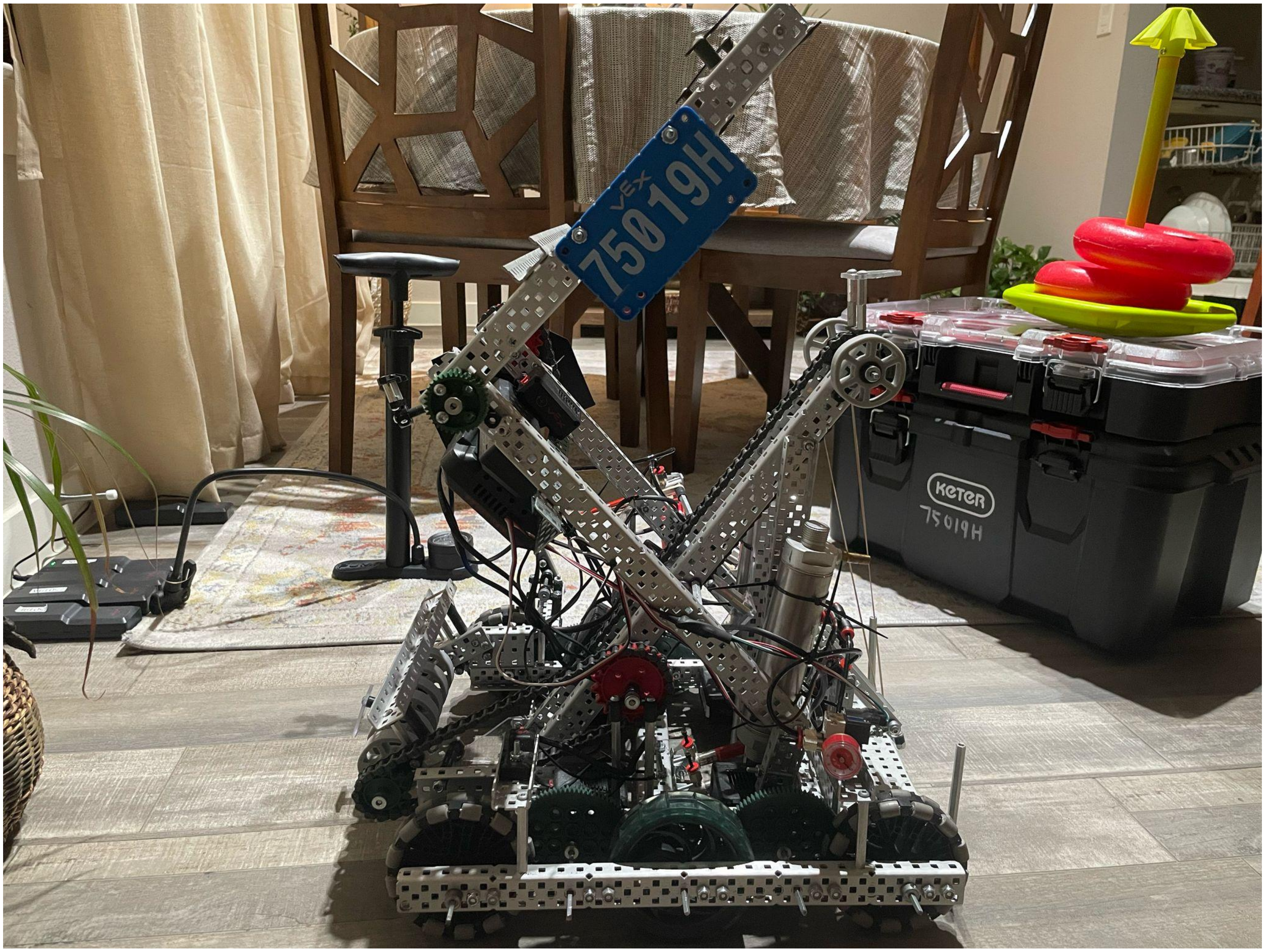
Project Pneumatics

Issues and challenges with the Pneumatics

1. We faced many issues while building the goal clamp. It took Neerav many tries to find the perfect angle for the stake to rest so that the rings would fall in seamlessly .
2. When we first tried to build the aligners, we built too far up to the goal clamp which meant that the aligners weren't really doing much because stake is supposed to be aligned first and then pulled in by the goal clamp.
3. Finding the optimal and best position for the pistons was also a difficult task because if the pistons were not placed properly, there pulling strength would not that good.
4. Dealing with the doinker was also annoying because making it retract and stay stable was really difficult. For example when were almost running out of air, the doinker was down but when we tried to retract, it just wasn't able to retract

Over the work days, we dealt with these challenges and perfected the doinker, goal clamp, piston positioning and the aligners.
To solve the doinker problem we simply added rubber bands which made a quick and easy fix. For the goal clamp we had constantly go through trial and error to find the best angle. As for the piston position we tried position the piston at the bottom of the hook and it surprisingly worked out well. And finally for the aligners, we just moved them back and they became the best aligners we have seen

Finished Product



This is our fully built and completed robot, ready for the VEX state competition this Saturday, March 1st.

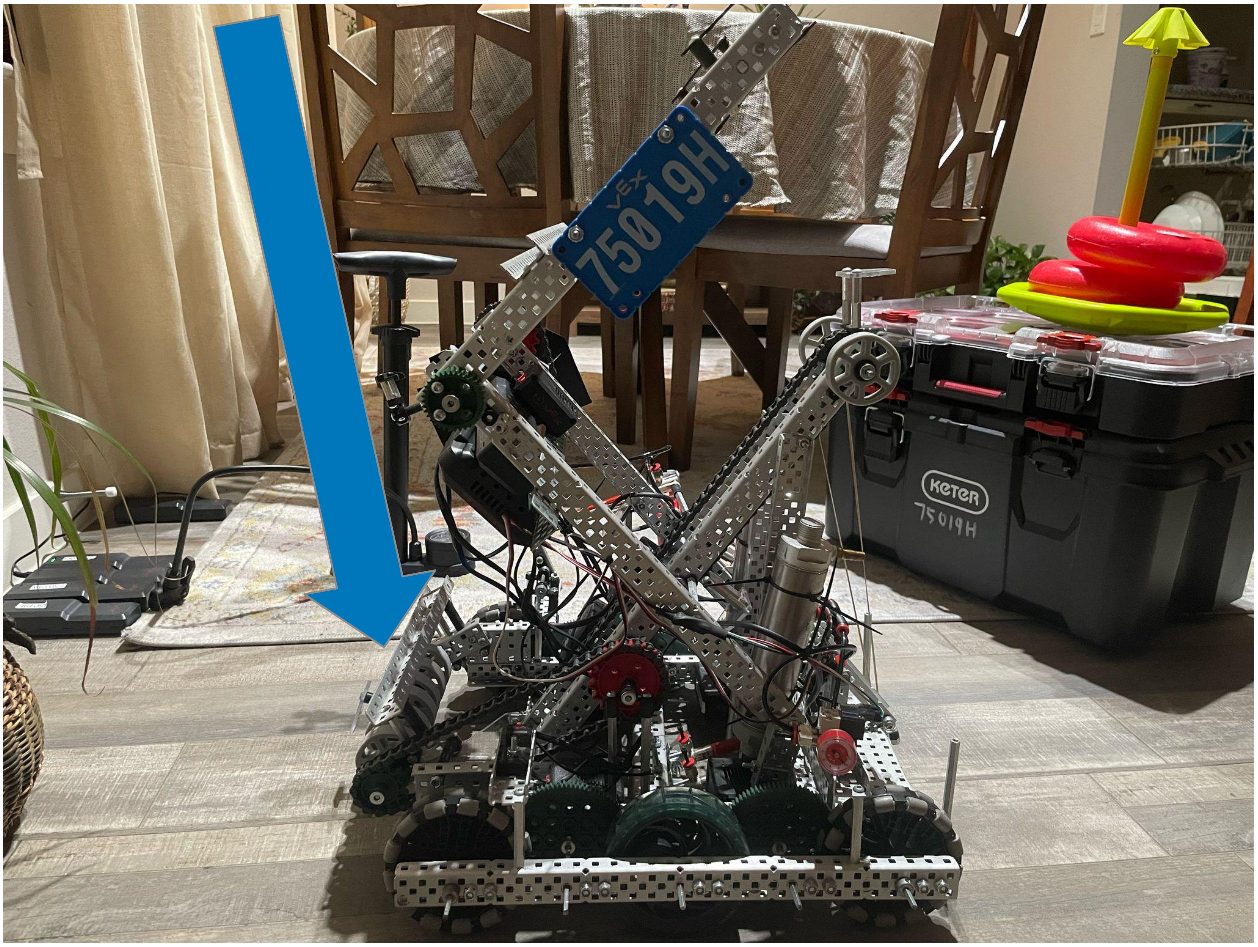
Project Finished Product

Name AutoBots Date 2/24/25

I will now go through the basic steps of the ring going from floor to stake.

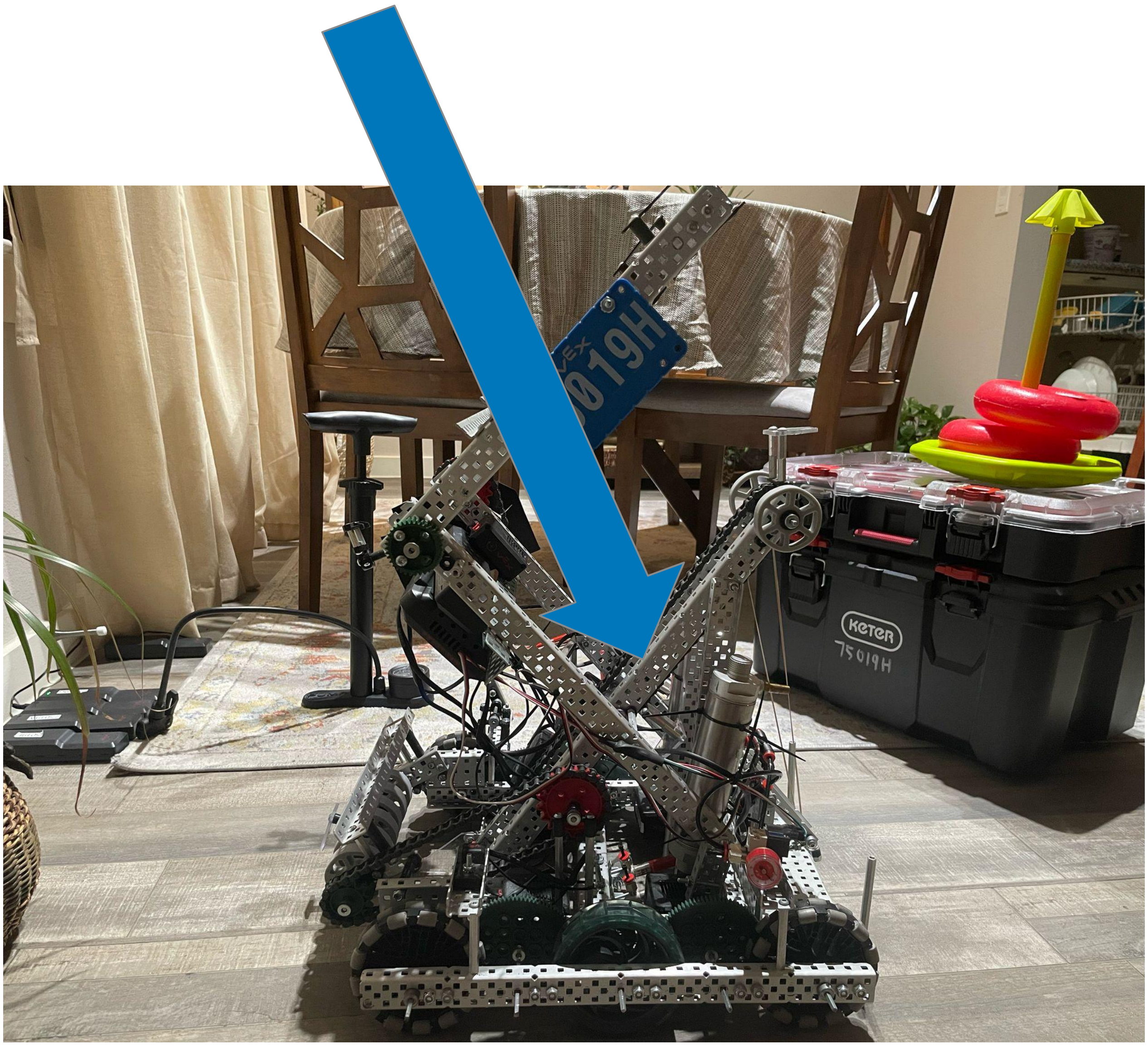
Step 1:

The bot moves up the ring and the intake rolls it up the polycarbonate ramp in 1 rotation, thanks the special component on the intake wheels



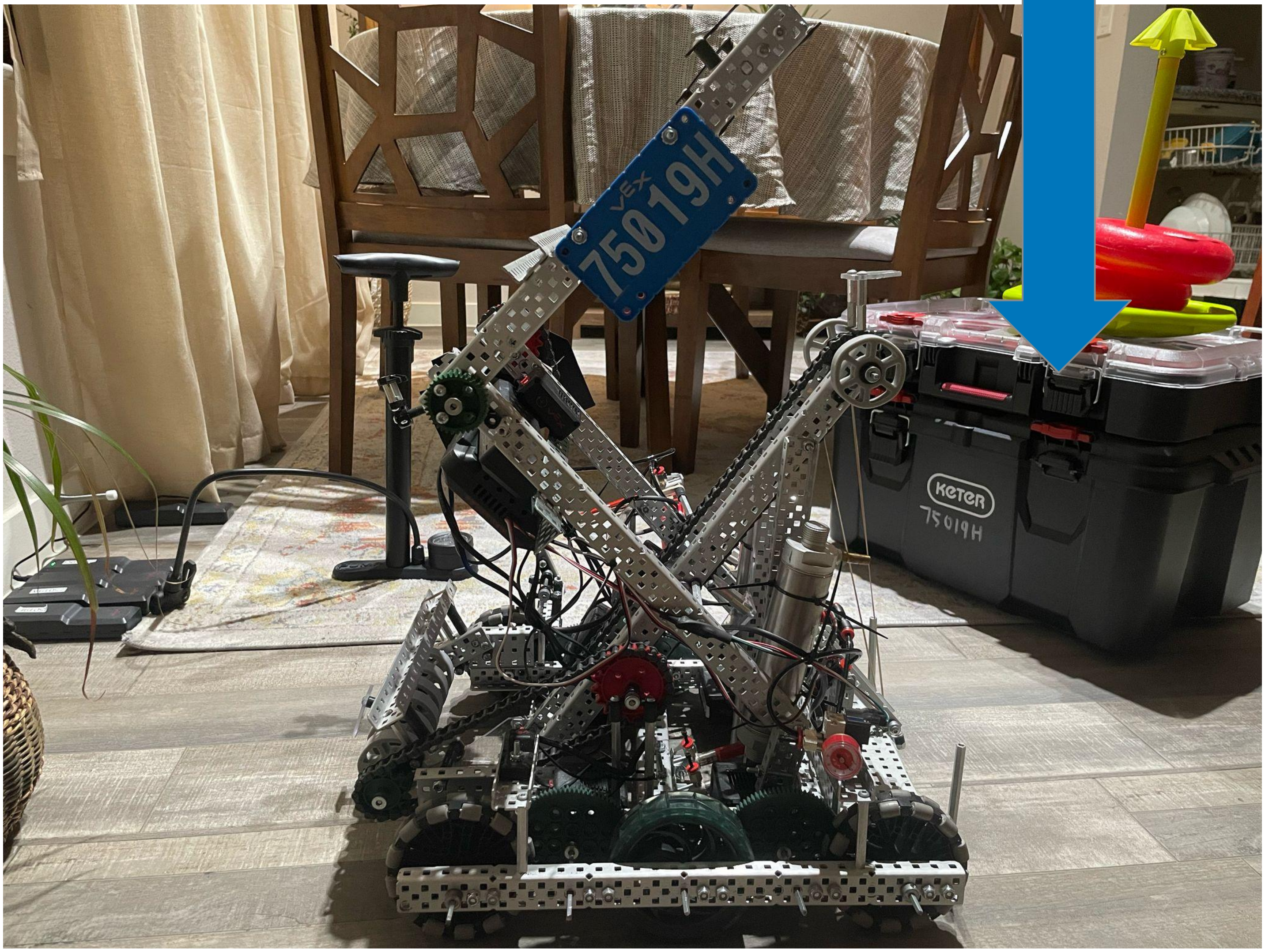
Step 2:

Rings goes up the conveyor belt on the hanging on 1 of 3 polycarbonate hooks



Step 3:

The ring reaches the top and falls off the polycarbonate piece, down onto the stake at the back.



Programming

This is the coding section of our documentation. I have all versions of the programming for the driver part and autonomous code.

I have it organized from the start code to the most recent code. It goes from February 1st to February 28th.

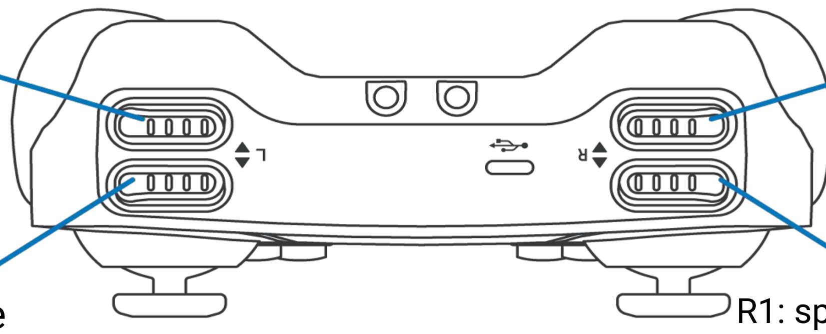
The code has been adapted to its final version and it encompasses driver control skills, autonomous skills, alliances red left autonomous/driving, alliances red right autonomous/driving, alliances blue left autonomous/driving, and alliances blue right autonomous/driving.

This section explains every single controller button function and how the user will be using it with arcade control. The controller buttons are R1, R2, L1, L2, X, and B. These controls are what runs the entire function of the robot.

On the following pages containing images of code, we will have a format of 1 page with a picture for code, next page explains it, and repeat all the way up to the newest code.

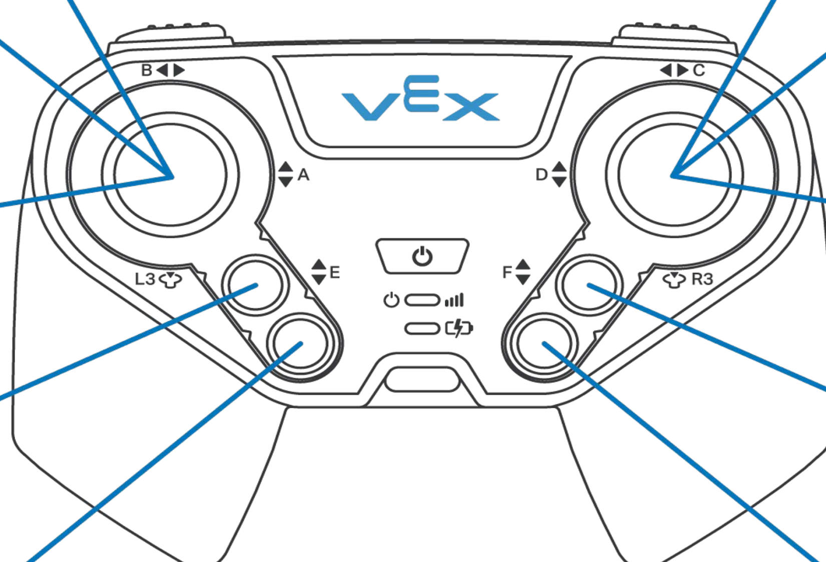
L2: spins the track and intake reverse while the user is holding the button.

L1: track and intake forward while the user is holding the button.



R1: spins the track and intake forward while the user just clicks the button and stops when user releases the button

Uses Left and Right Motors multiplies them by a velocity and spins them.



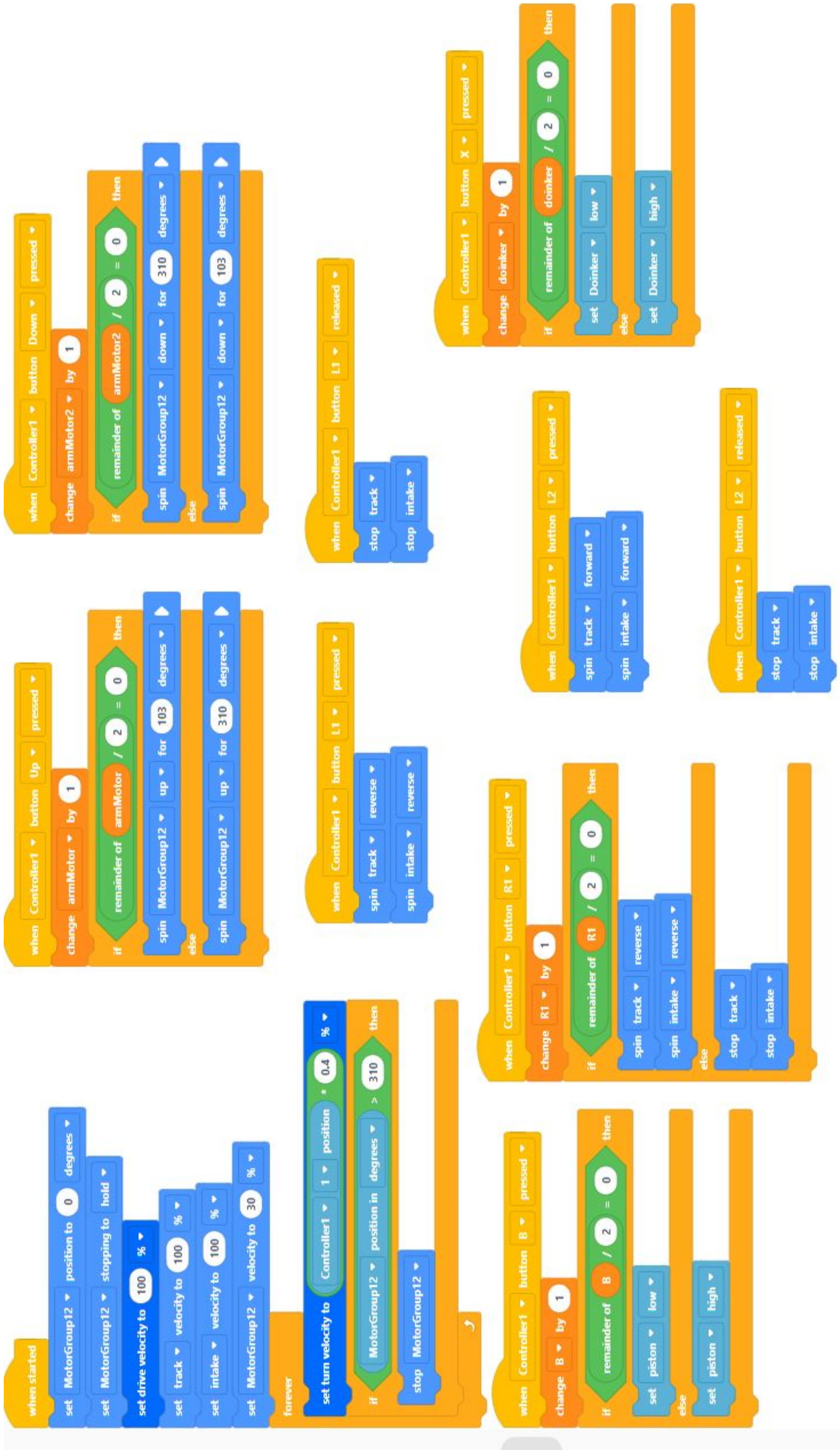
Also uses Left and Right motors and multiplies them by a velocity and spins them but it turns the robot

X: This released and unreleased the doinker switching between every click.

B: This releases and clamps the piston switching between every click.

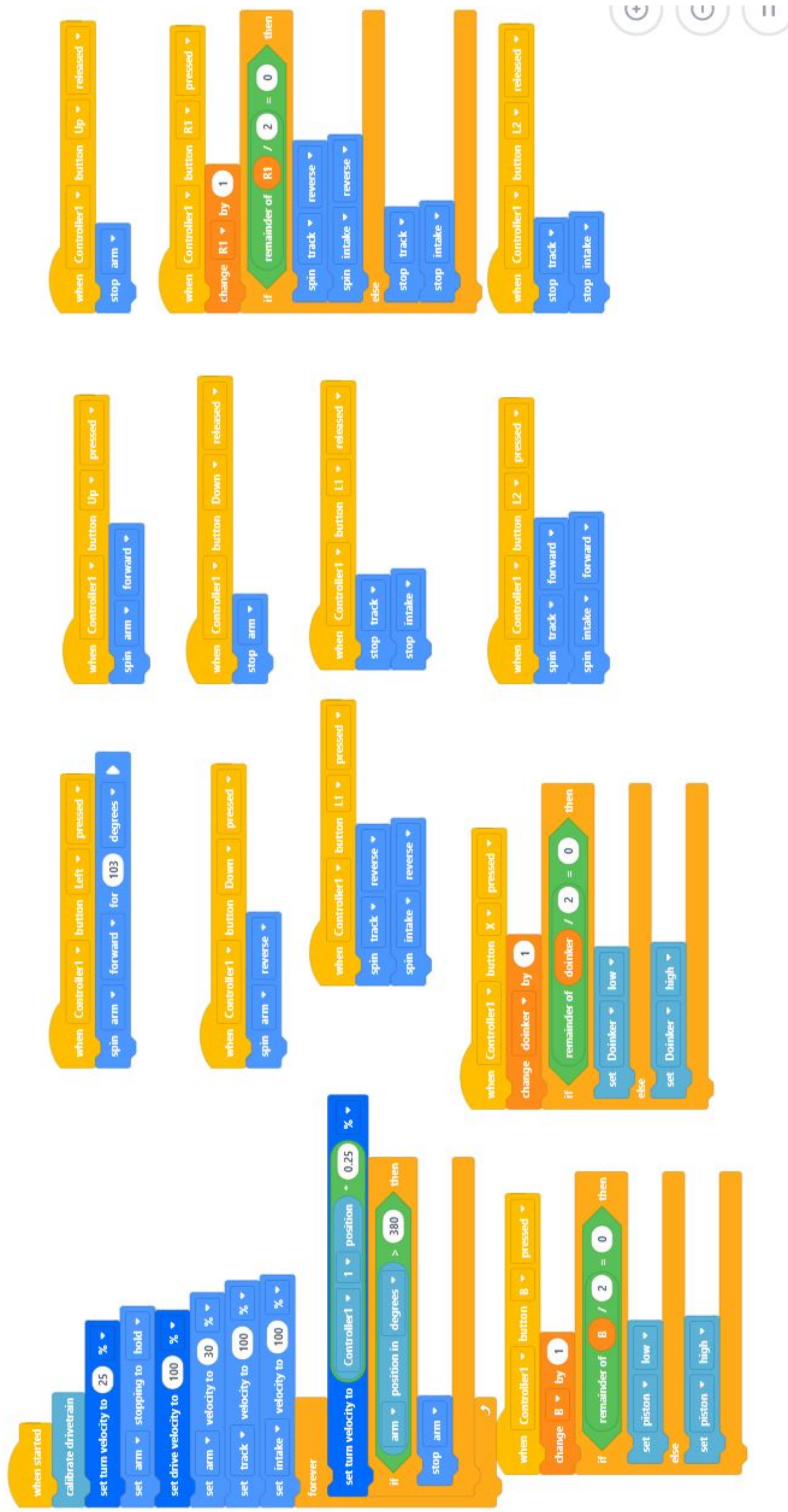
Project Controls

Name AutoBots Date 2/20/25 Page 161


when Controller1 button Down pressed
change armMotor2 by 1
if remainder of armMotor2 / 2 = 0 then
spin MotorGroup12 down for 310 degrees
else
spin MotorGroup12 down for 103 degrees
when Controller1 button L1 released
stop track
stop intake
when Controller1 button X pressed
change doinker by 1
if remainder of doinker / 2 = 0 then
set Doinker low
else
set Doinker high
when Controller1 button L2 pressed
spin track forward
spin intake forward
when Controller1 button L2 released
stop track
stop intake
when Controller1 button Up pressed
change armMotor by 1
if remainder of armMotor / 2 = 0 then
spin MotorGroup12 up for 103 degrees
else
spin MotorGroup12 up for 310 degrees
when Controller1 button L1 pressed
spin track reverse
spin intake reverse
when Controller1 button R1 pressed
change R1 by 1
if remainder of R1 / 2 = 0 then
spin track reverse
spin intake reverse
else
stop track
stop intake
when started
set MotorGroup12 position to 0 degrees
set MotorGroup12 stopping to hold
set drive velocity to 100 %
set track velocity to 100 %
set intake velocity to 100 %
set MotorGroup12 velocity to 30 %
forever
set turn velocity to Controller1 1 position * 0.4 %
if MotorGroup12 position in degrees > 310 then
stop MotorGroup12
when Controller1 button B pressed
change B by 1
if remainder of B / 2 = 0 then
set piston low
else
set piston high

When started:
- sets velocity and stopping
- a forever loop setting the turn velocity based on controllers turning axis and it caps the arm at a certain angle so it won't go farther than that angle based on the arms angle at that moment in time

When button b pressed: switches between clamping on to stake and unclamping on to stake at a button press
When L1 pressed: spins the track forward
When L1 released: stops track
When R1 pressed: switches between spinning the intake forward and stopping the intake when the button is pressed
When Up pressed: arm goes to grabbing position when clicked and scoring position when clicked again
When down pressed: arm goes from scoring position back to grabbing position when clicked and grabbing position to zero position when clicked again
When R2 pressed: spins the intake backward
When R2 released: stops the intake
When L2 pressed: spins the track reverse
When L2 released: stops the track
When button X pressed: operates doinker and uses pneumatics to switch between down and up when button is pressed.



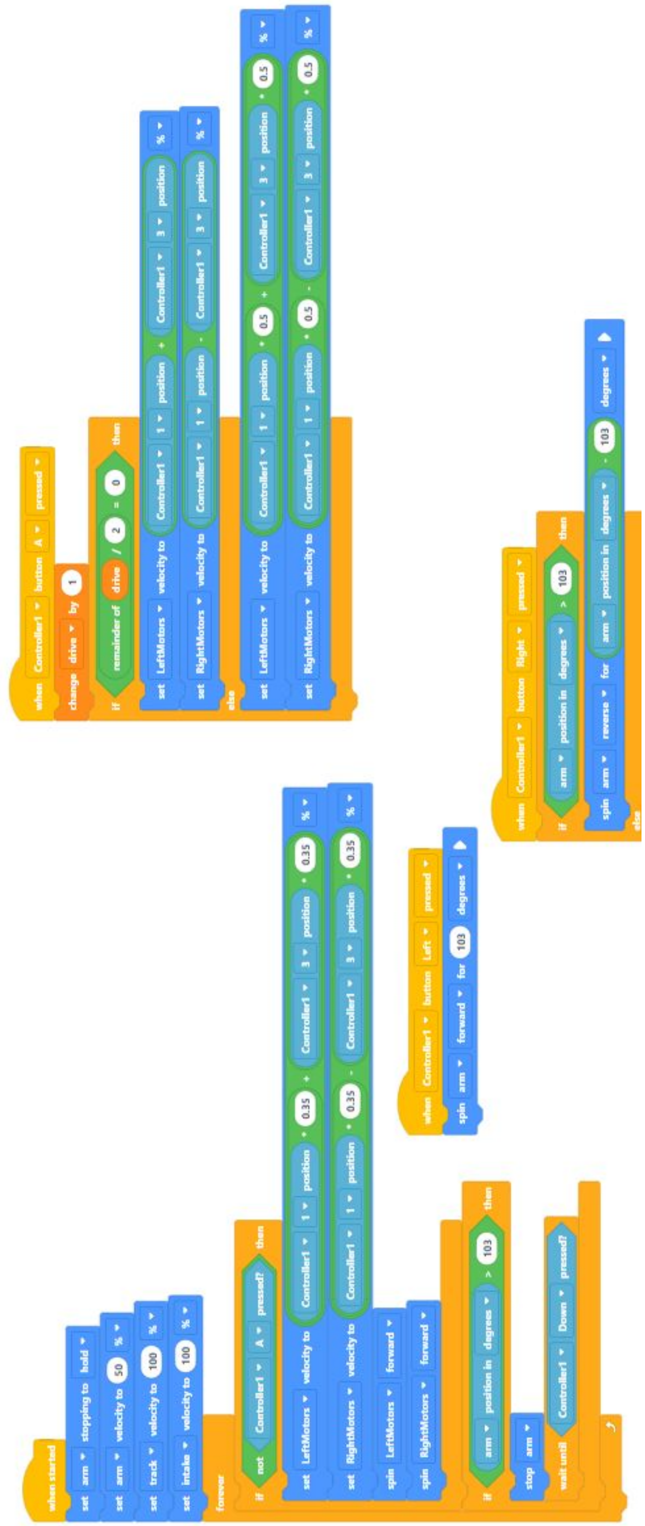
Project Programming

Name AutoBots Date 2/20/25

I changed the arm controls so that the arm can't go farther than a certain position and changed the arm to one motor. We calibrated the drivetrain and changed gear ratio on the drive train. Also attempted to change turn velocity so that driver can turn easier and not have to stress about how much to to turn the stick.

When you press and hold up the arm will go up that much and when you press and hold down it will go down by that much. If you press left it will go up by a certain amount of degrees to the grabbing position.

The turning velocity was not able to be changed on this day as after much research we could not find a solution. We did attempt it but nothing worked. This was very frustrating as after a few months of research it wasn't working.



Project Programming

Name AutoBots Date 2/20/25

After a few months of research, trial, and error we were able to change the velocity of the drivetrain. This was a massive breakthrough after research which was a huge step forward for our team.

In the forever loop, inside when started, I split the drivetrain into two different sides and the left motors take the controller's position 1 which is left and right, multiply it by a certain velocity our driver needs and add it to position 3 while multiplying that by the same velocity multiplying position 1(position 3 is forward and backward, and Position 1 is left and Right).

The right motors take the controller's position 1 multiply it by the exact same velocity for left motors then subtract by position 3 multiplied by that exact same velocity. I then run both of the sides forward. I put the same function for pneumatics in the button except copied the code from when it started.


when started
set drive stopping to hold
set track velocity to 100 %
set intake velocity to 100 %
set drive velocity to 50 %
spin track forward
wait 0.3 seconds
stop track
wait 0.2 seconds
drive forward for 10 inches
wait 0.05 seconds
turn to rotation -88 degrees
wait 0.01 seconds
set drive velocity to 60 %
drive reverse for 7 inches
wait 0.01 seconds
set drive velocity to 20 %
drive reverse for 8 inches
wait 0.03 seconds
set piston high
wait 0.03 seconds
set drive velocity to 60 %

We have to calibrate for drift so angles are 2 degrees off.The robot calibrates its inertial sensor for around 2 - 3 seconds and then it starts the entire program. The robot sets stopping and velocities then runs the track to put the ring on the wall stake.

Afterwards it goes forward 10 inches and goes to position -88 degrees which turns the bot so that it has the angle to move towards the stake. It then drives reverse for 7 inches at 60% velocity and 8 inches at 20% velocity in the perfect position to clamp on to the stake. It clamps onto the stake and sets the drive velocity to 60% (continue to next page).

```
turn to rotation 0 degrees
wait 0.1 seconds
set drive velocity to 30 %
spin intake forward
spin track forward
drive forward for 17.5 inches
wait 0.05 seconds
turn to rotation 88 degrees
wait 0.05 seconds
drive forward for 17.5 inches
wait 0.05 seconds
turn to rotation 178 degrees
stop track
wait 0.03 seconds
drive forward for 13 inches
wait 0.3 seconds
spin track forward
wait 0.1 seconds
drive forward for 9 inches
wait 0.07 seconds
turn to rotation -58 degrees
wait 0.05 seconds
drive reverse for 7 inches
wait 0.03 seconds
set piston low
```

The robot turns to the angle 0 degrees to align itself with the first ring to grab it. I then sets velocity to 30% and spins intake while going forward 17.5 inches.. Then the robot turns to 88 degrees and moves forward for another 17.5 inches to grab the second ring. Afterward it turns to 178 degrees and stops the track.

It then drives forward for 13 inches with a slight delay to spin the track to grab the third ring and puts it on the stake. It then moves forward 9 inches to put the 4th ring and put it on the stake. It then turns to -58 degrees and pushes the stake into the placeholder by moving backwards 7 inches. The robot releases the stake and stops the track (continue to next page).

```
wait 0.01 seconds
stop track
stop intake
wait 0.05 seconds
drive forward for 16.5 inches
wait 0.07 seconds
turn to rotation 87 degrees
wait 0.05 seconds
set drive velocity to 50 %
drive reverse for 30 inches
wait 0.01 seconds
set drive velocity to 15 %
drive reverse for 11 inches
wait 0.05 seconds
set piston high
wait 0.03 seconds
set drive velocity to 50 %
turn to rotation 0 degrees
wait 0.05 seconds
spin intake forward
stop track
drive forward for 17.3 inches
wait 0.05 seconds
spin track forward
turn to rotation -92 degrees
wait 0.07 seconds
drive forward for 17.5 inches
wait 0.05 seconds
turn to rotation -182 degrees
```

It also stops the intake and track and then drives forward 16.t inches. It turns to 87 degrees and then sets the drive velocity to 50. The robot goes backwards for 30 inches. It then sets the velocity to 15 and drives back 11 inches.

It clamps almost immediately after moving back 10 inches. After it clamps it sets velocity back to 50 and then turns to 0 degrees and spins the intake forward while stopping the track. It then moves forward for 17.3 inches and with a slight delay starts the track to grab the first ring for the second stake. After that it turns to rotation - 92 and it drives forward for 17.5 inches to grab the second ring for 2nd stake. Afterwards turns to rotation -182 (continue to next page)

```
spin track forward
wait 0.05 seconds
drive forward for 15 inches
wait 0.3 seconds
set drive velocity to 50 %
drive forward for 6 inches
wait 0.1 seconds
turn to rotation 60 degrees
wait 0.07 seconds
drive reverse for 7 inches
wait 0.07 seconds
set piston low
stop track
wait 0.3 seconds
drive forward for 17 inches
wait 0.05 seconds
turn to rotation -1 degrees
wait 0.08 seconds
stop intake
wait 0.08 seconds
set drive velocity to 50 %
drive forward for 62 inches
wait 0.03 seconds
turn to rotation -146 degrees
wait 0.1 seconds
set drive velocity to 20 %
drive reverse for 14 inches
```

Stops the track and then goes backward 15 while starting the track to get the 3rd ring for 2nd stake. It then drives forward for 6 inches at 50% velocity to grab the 4th ring for the 2nd stake. The robot rotates to 60 degrees and releases the second stake.

It stops the track and then moves forward 17 inches to align to a spot with no rings. It turns to -1 degrees with a slight delay. It then sets velocity to 50% and drives forward for 62 inches. It rotates to -146 degrees to align itself to grab the 3rd stake. The robot then sets the drive velocity to 20% and reverses for 14 inches (continue to next page).

```
wait 0.4 seconds
set piston high
wait 0.03 seconds
turn to rotation 94 degrees
wait 0.1 seconds
set drive velocity to 40 %
drive reverse for 20 inches
wait 0.01 seconds
set piston low
wait 0.5 seconds
drive forward for 13 inches
wait 0.03 seconds
turn to rotation -88 degrees
wait 0.03 seconds
set drive velocity to 50 %
drive reverse for 50 inches
wait 0.01 seconds
set piston high
wait 0.2 seconds
set drive velocity to 70 %
drive forward for 30 inches
```

It clamps on to the stake and with a slight delay turns to rotation 94 degrees. It then sets the drive velocity to 40 degrees and then reverses 20 inches to put the stake into the corner.

The robot releases the stake and drives forward for 13 inches and turns to rotation -88 degrees. It sets the drive velocity to 50% and and drives reverse 50 inches to be right there to the last stake. It clamps onto the last stake and drives forward for 30 inches to ram it into the last corner (continue to next page).


stop track
wait 0.3 seconds
drive forward for 17 inches
wait 0.05 seconds
turn to rotation -1 degrees
wait 0.08 seconds
stop intake
wait 0.08 seconds
set drive velocity to 50 %
drive forward for 62 inches
wait 0.03 seconds
turn to rotation -146 degrees
wait 0.1 seconds
set drive velocity to 20 %
drive reverse for 14 inches
wait 0.4 seconds
set piston high
wait 0.03 seconds
turn to rotation 94 degrees

The robot stops the track and then waits 0.3 seconds until it drives forward for 17 inches and has a slight delay until it turns so that the front of the robot faces the other wall. The robot then stops the intake and then with a slight delay it goes forward for 62 inches.

The robot has a slight delay until it rotates to -146 so the back of the robot faces the stake and the robot can go into the stake at 20% velocity and reverse 14 inches. After it clamps onto the robot it has a very slight delay and then rotates to 94 degrees (continue to next page).

```
wait 0.1 seconds
set drive velocity to 40 %
drive reverse for 20 inches
wait 0.01 seconds
set piston low
wait 0.5 seconds
drive forward for 13 inches
wait 0.03 seconds
turn to rotation -88 degrees
wait 0.03 seconds
set drive velocity to 50 %
drive reverse for 50 inches
wait 0.01 seconds
set piston high
wait 0.2 seconds
set drive velocity to 70 %
drive forward for 30 inches
```

The robot waits 0.1 seconds; it sets drive velocity to 40% velocity and then drives backward for 20 inches to put the stake into the corner and then releases the stake. The robot waits half a second and then drives forward for 13 inches and then with a slight delay rotates to -88 degrees so that the back of the robot faces the stake.

After a little delay it sets velocity to 50% and reverses 50 inches and clamps immediately after reversing 50 inches. It then rams the stake into the last corner (continue to next page).

Problems I had with code:

I had many problems when coding the robot. The biggest one was changing the drive and turn velocity in driver control. Originally I didn't know much about VEX since this was my first year but after a few months of research I was able to deduce that to get finer control over the drivetrain I had to split it in half as Left Motors and Right Motors and then set them equal to the controllers position when joysticks are moved. This took some trial and error but I eventually did it.

I was having a hard time coding auton because the robot was not very consistent, but we had an inertial sensor and were able to get the robot consistent after a few hours of work. The most frustrating problem is the wait time for everytime the robot turns because the inertial sensor calibrates for 3 seconds. The angles were based on the rotation of the robot as there are many

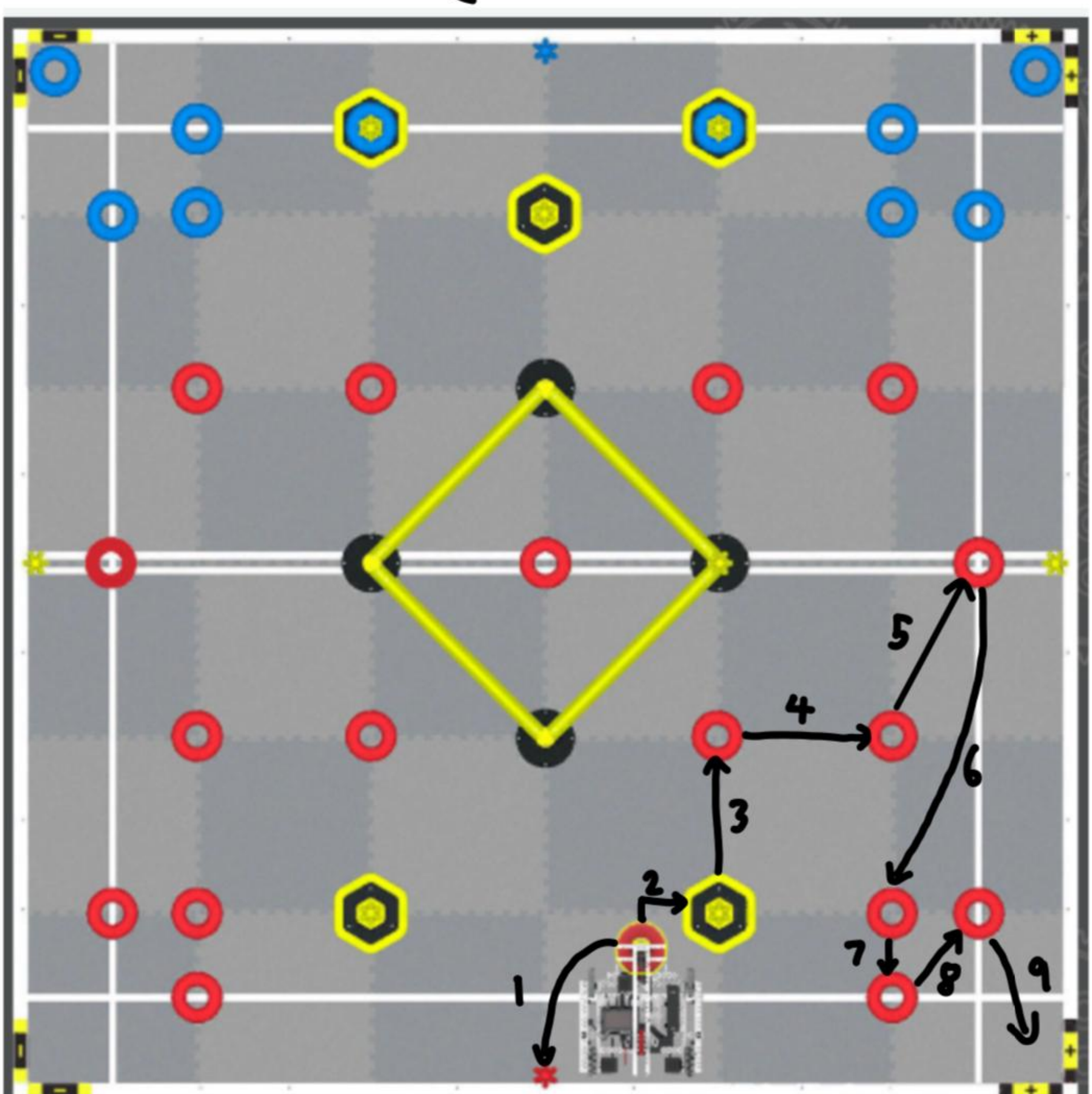
Strategies

The following pages contain the various strategies and plans to complete the autonomous section and driving section.

They are made from our first idea to our most current idea and show the paths.

Vex state skills path 1 (driver)

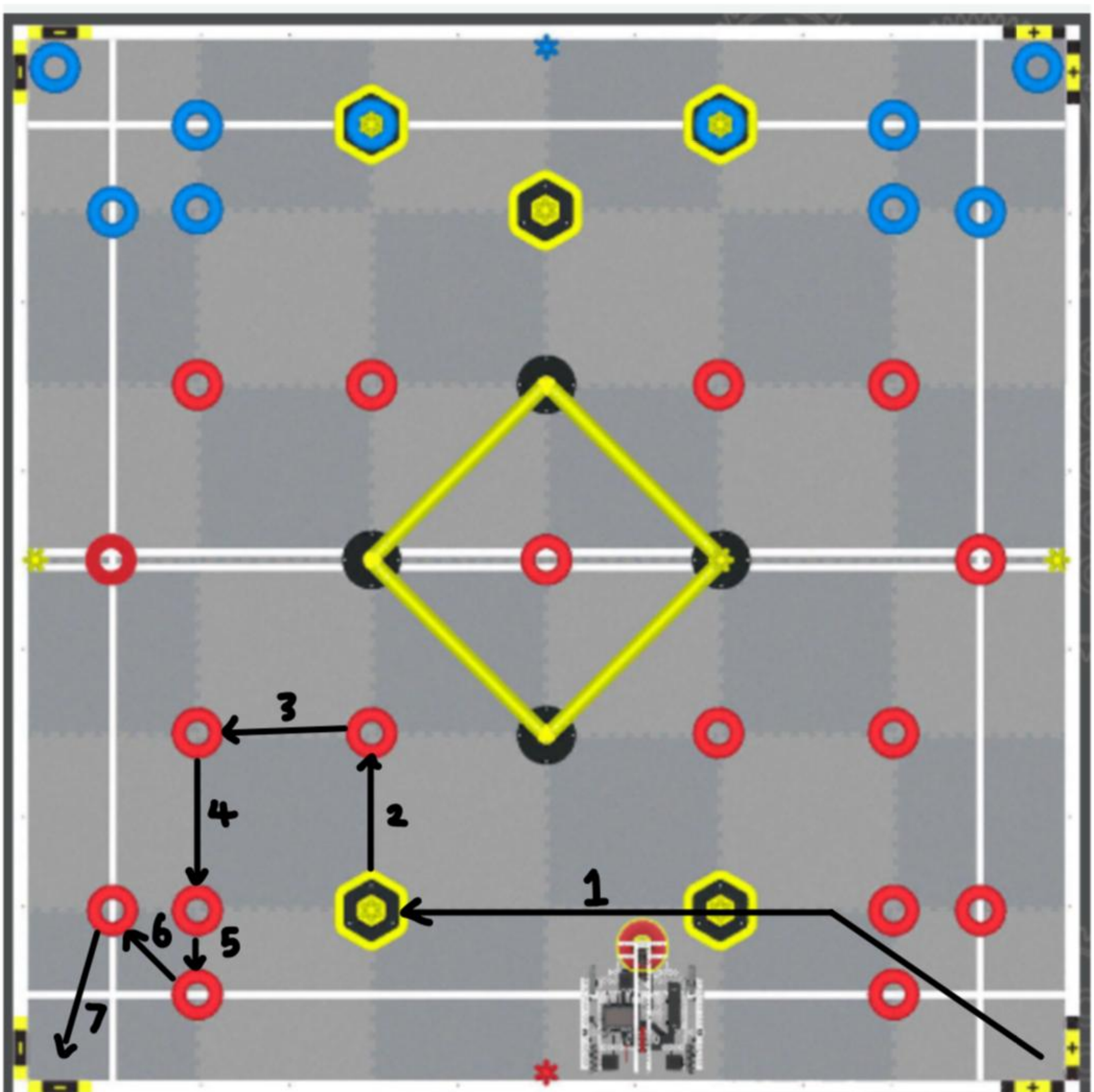
Phase 1 (16 points)



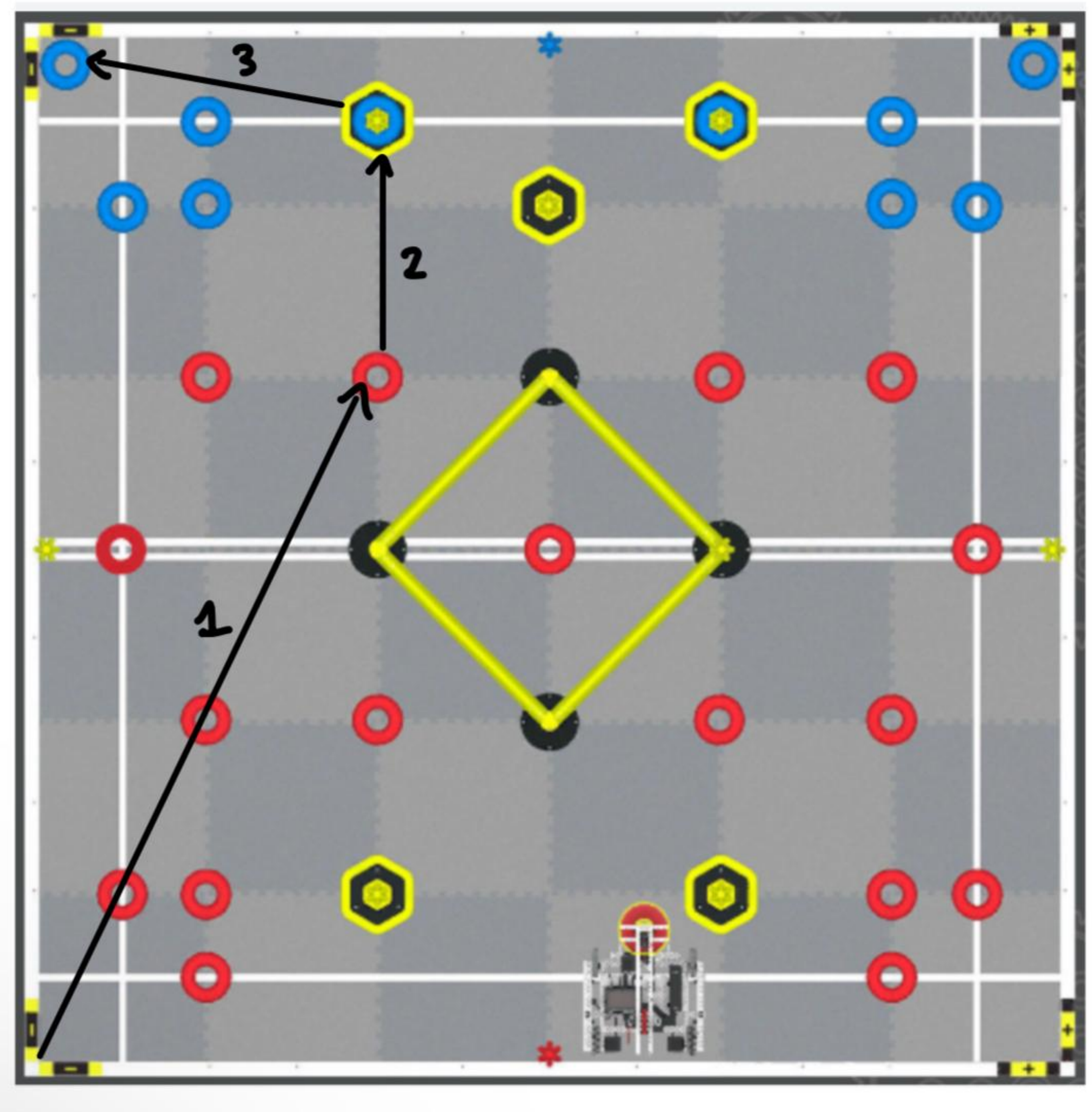
Project Strategies

Name AutoBots Date 2/27/25 Page 185

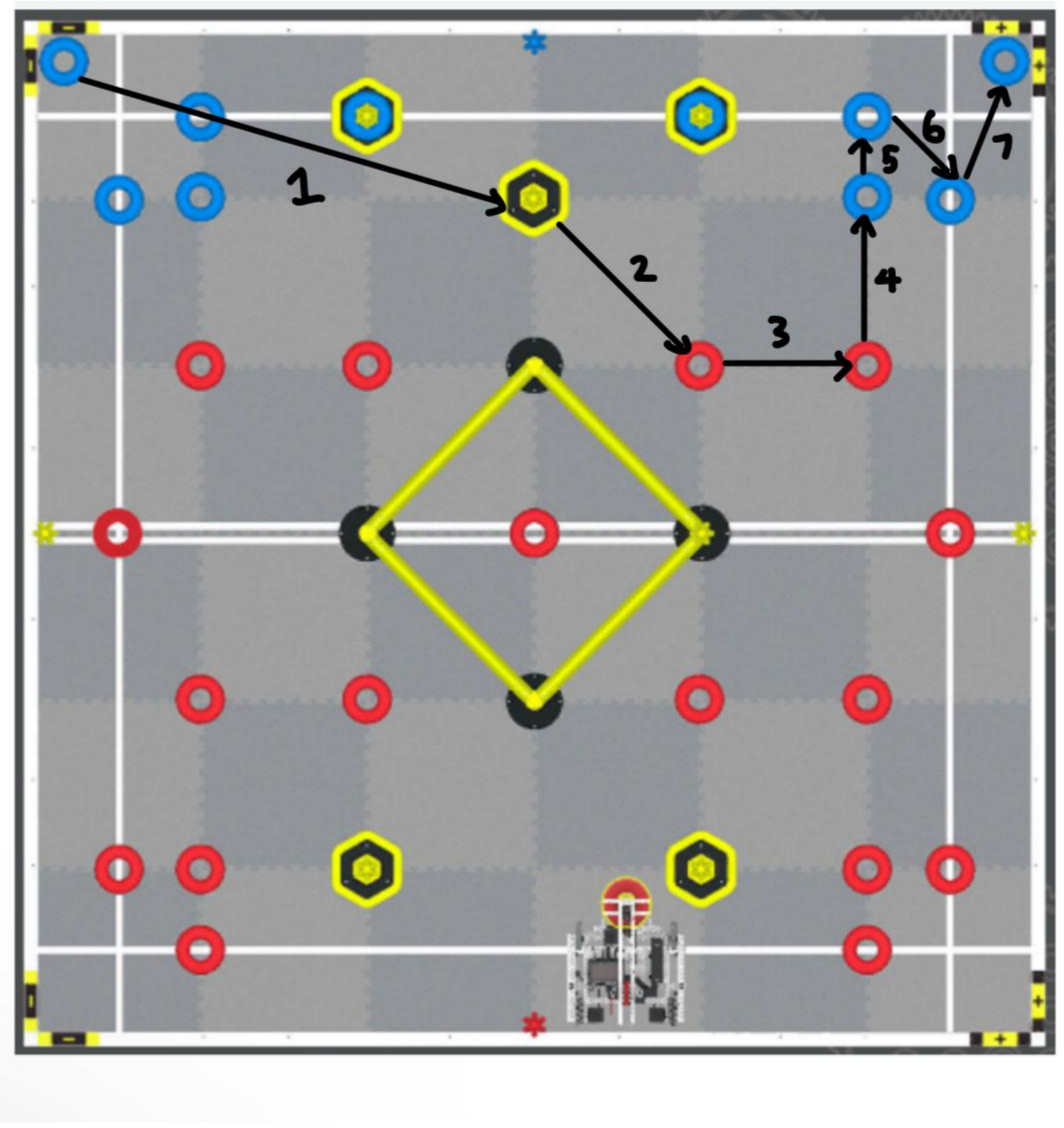
Phase 2 (12 points)



Phase 3 (5 points)

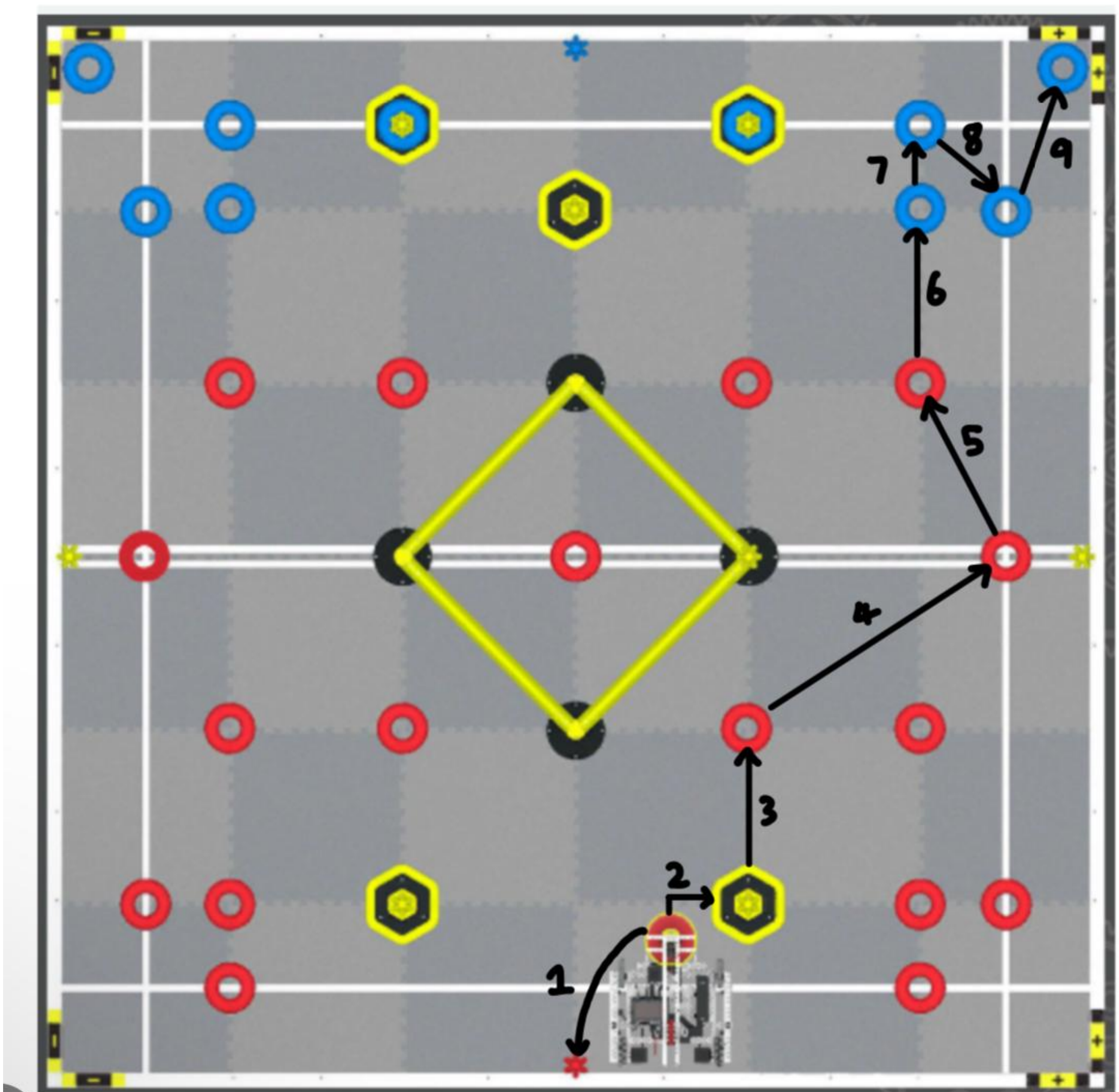


Phase 4 (13)



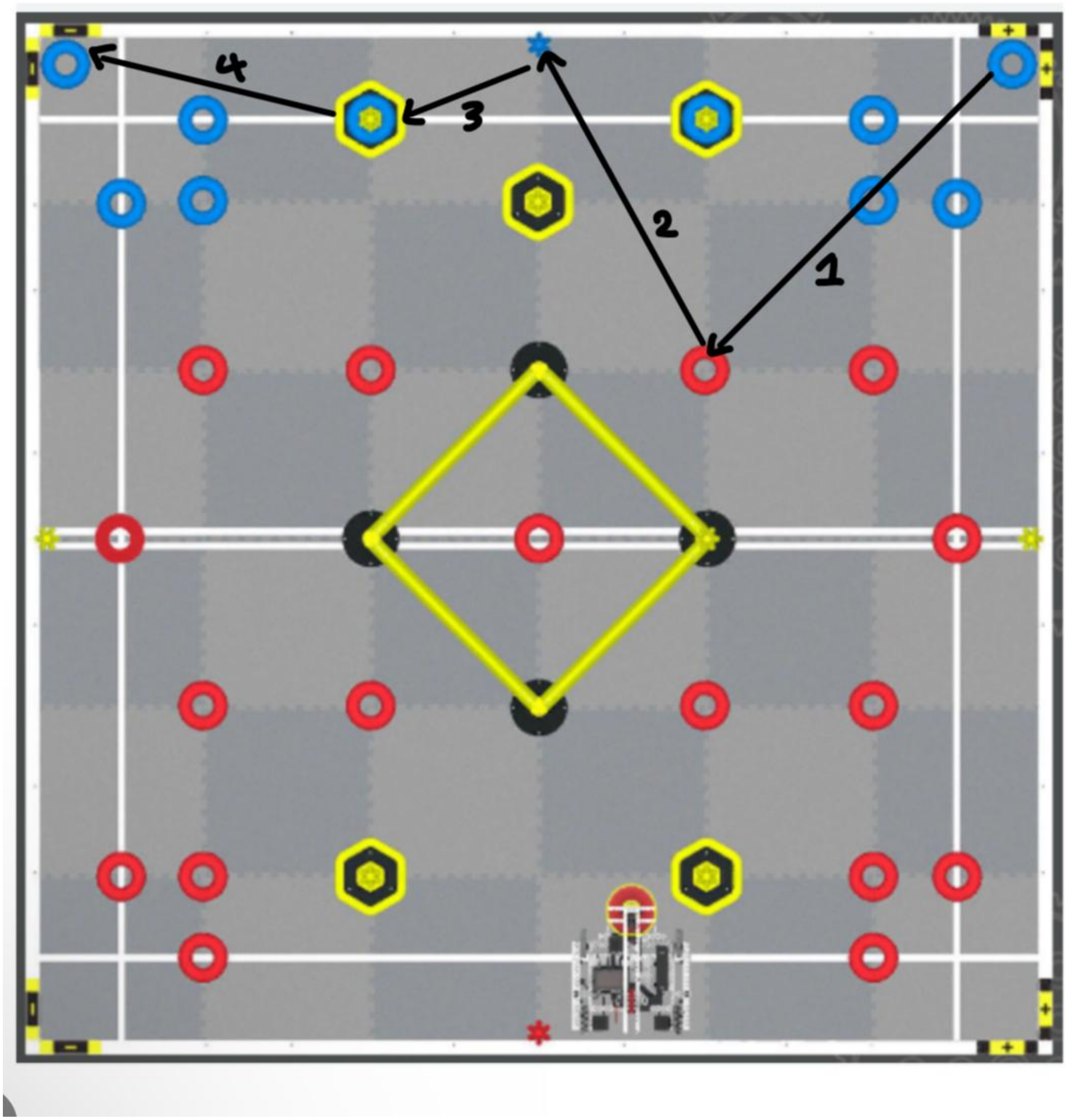
vex state driver skills 2
(using this one at states)
50 total

Phase 1 (16 points)



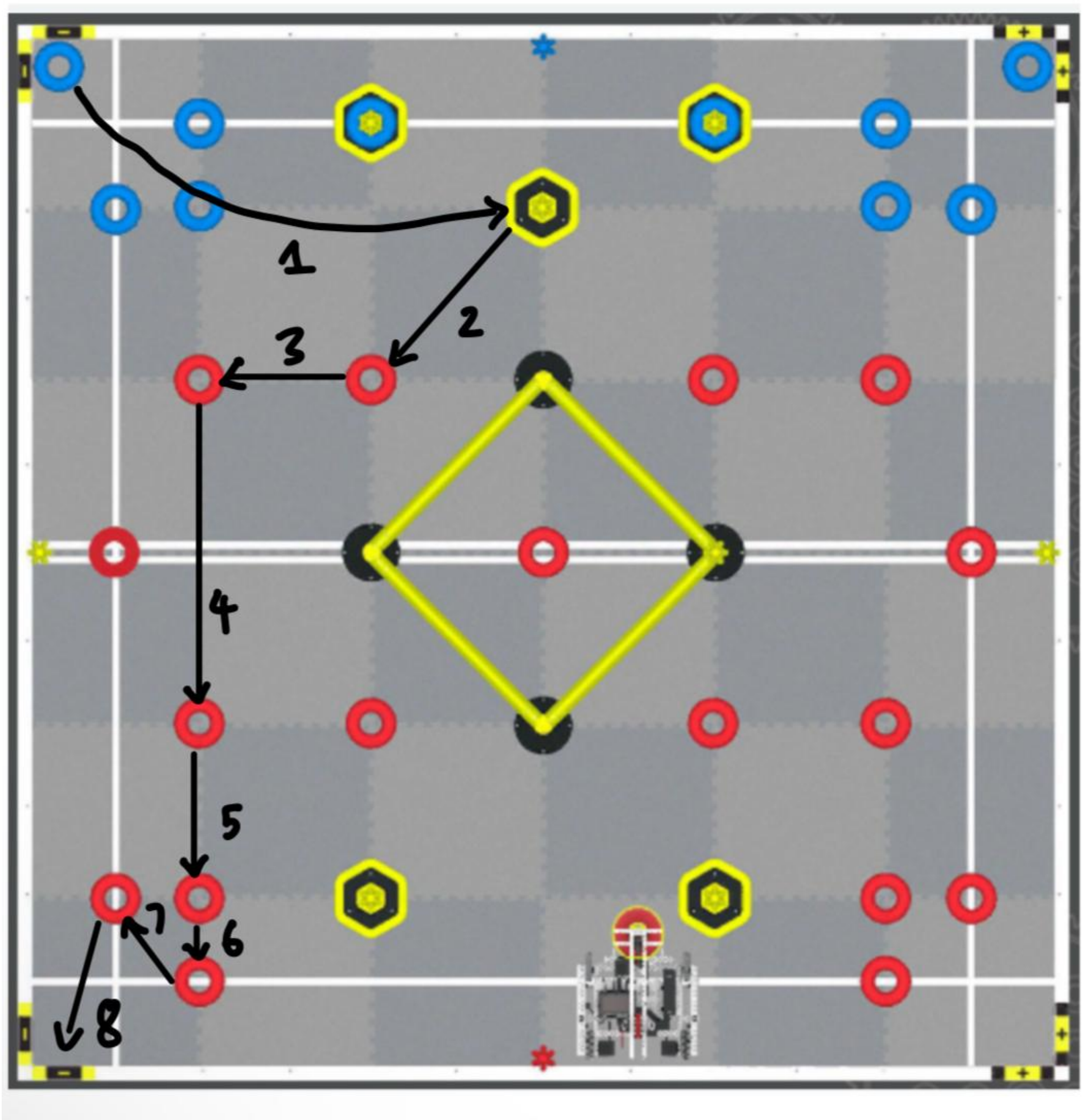
Phase 2

(8 points)



phase 3

(13 points)

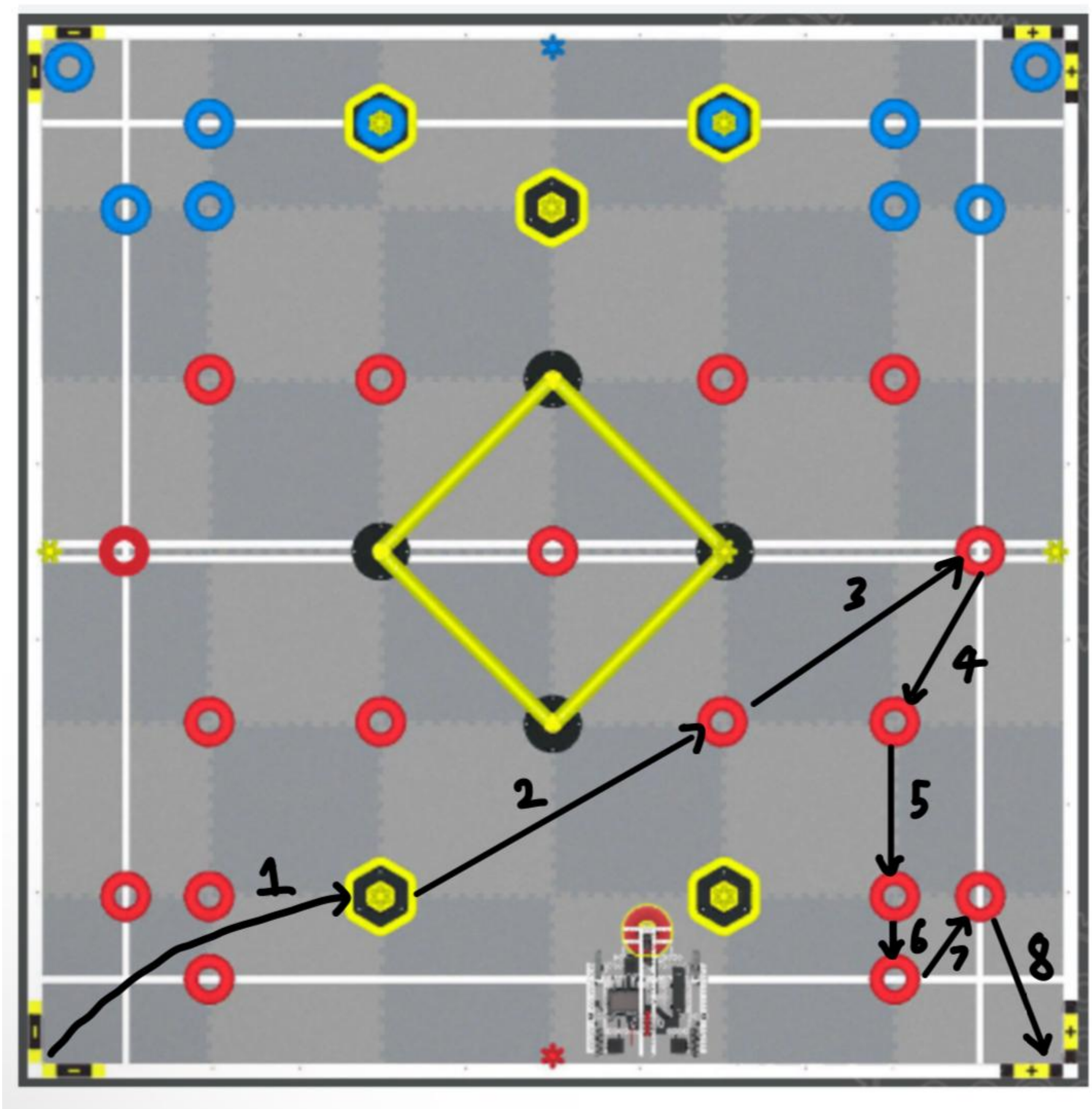


Project Strategies

Name AutoBots Date 2/27/25 Page 191

Phase 4

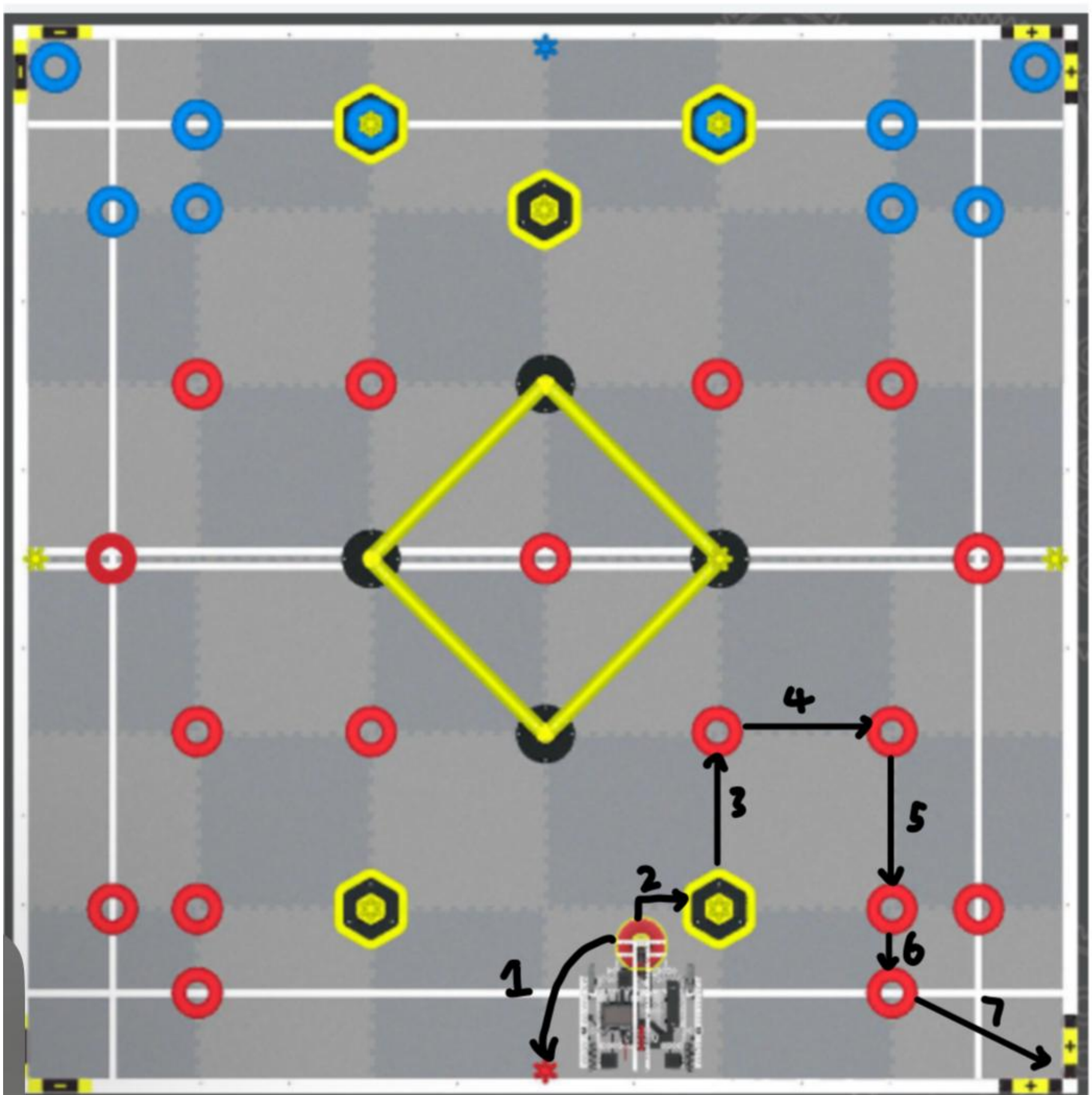
(13)



vex state Auton Skills
35 total

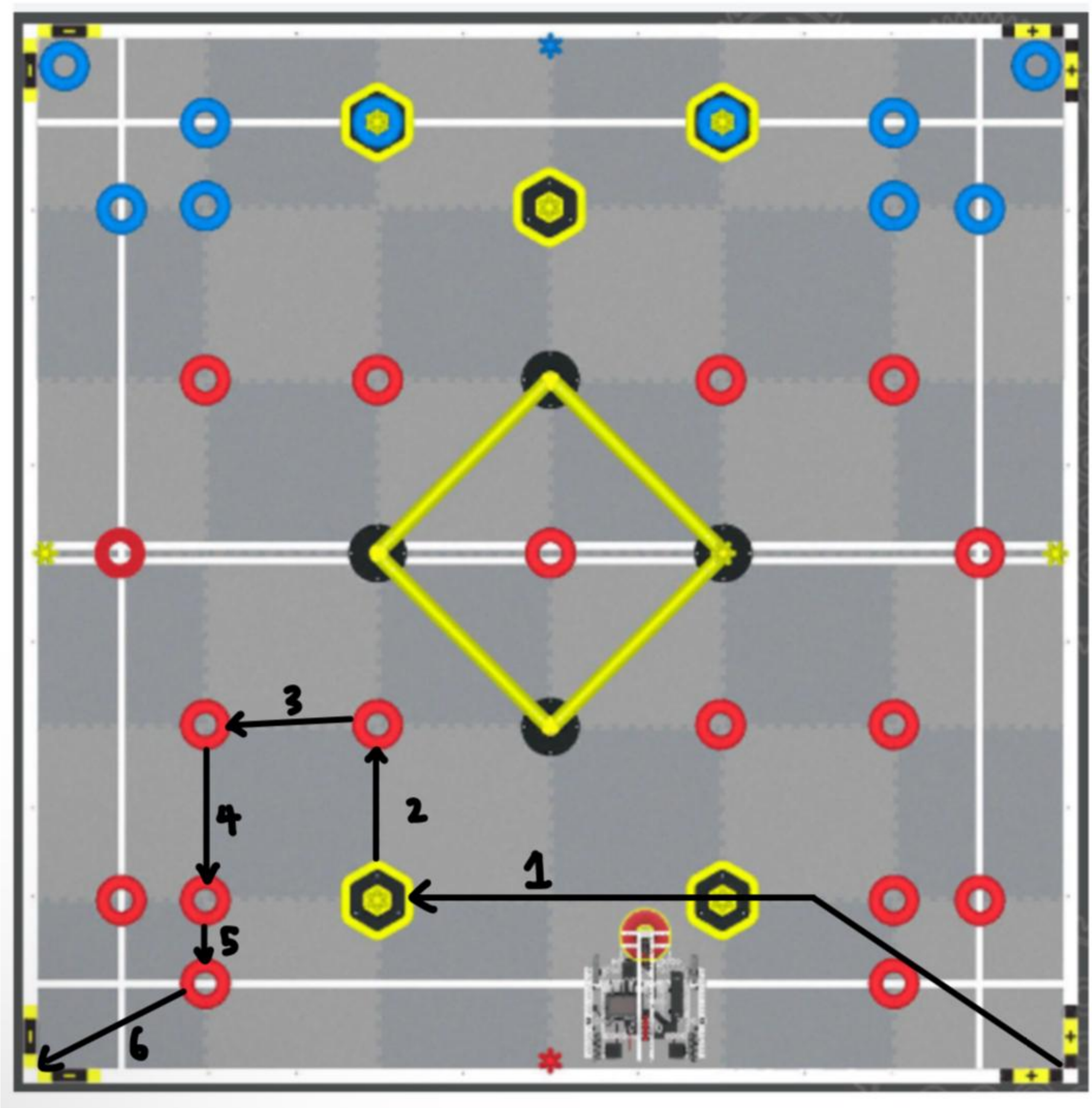
phase 1

(14 points)



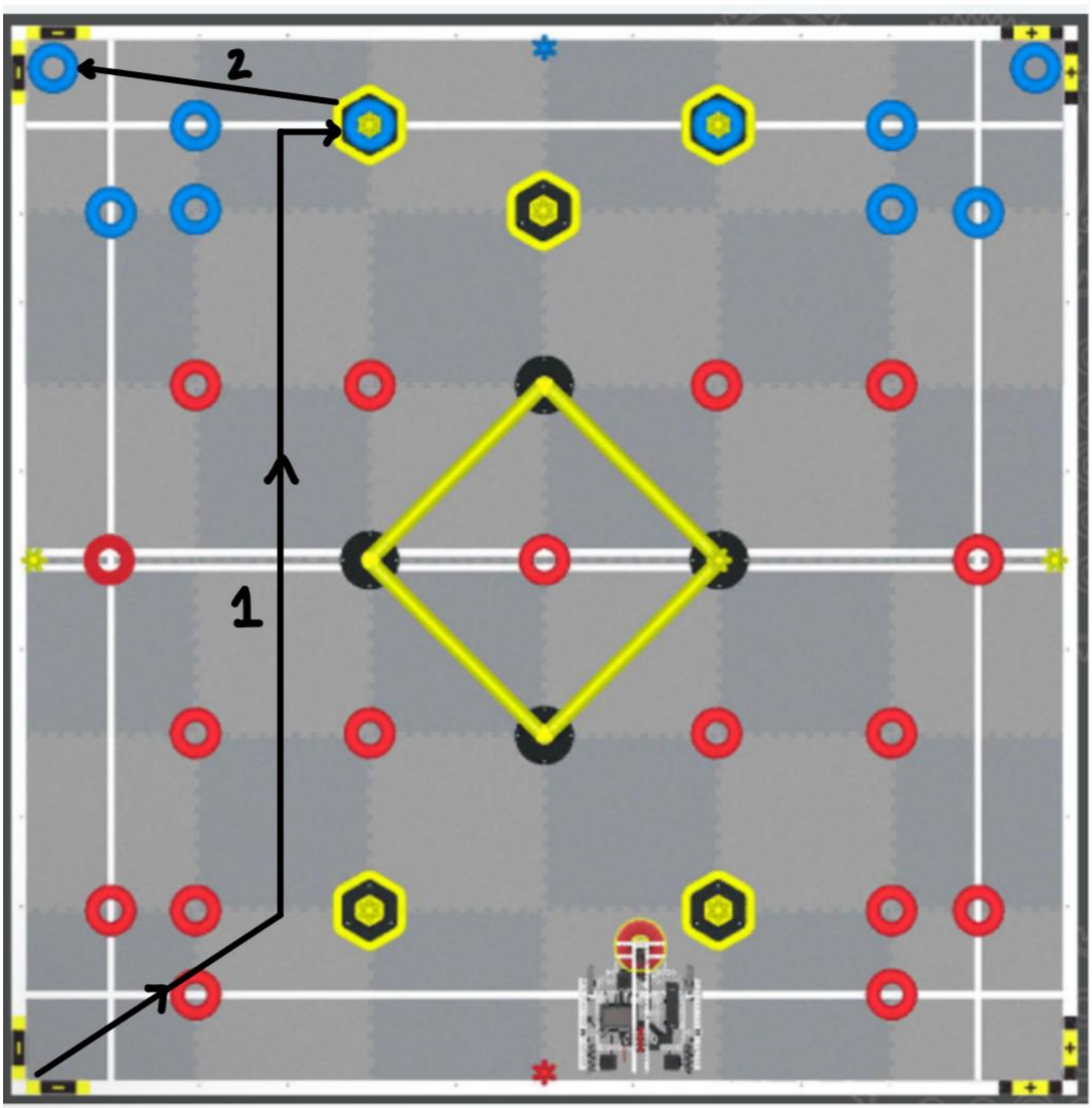
Phase 2

(11 points)



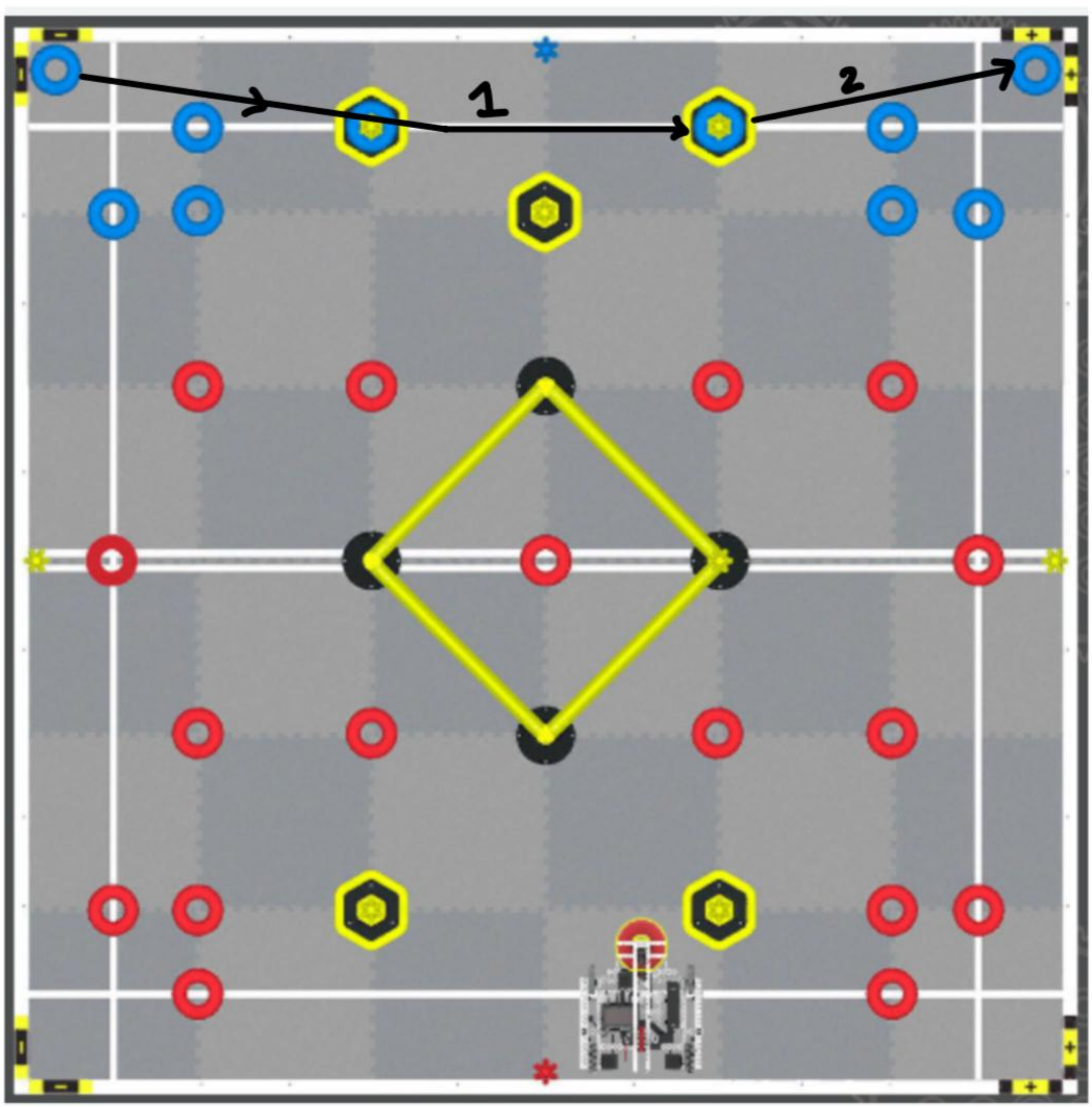
Phase 3

(5 points)

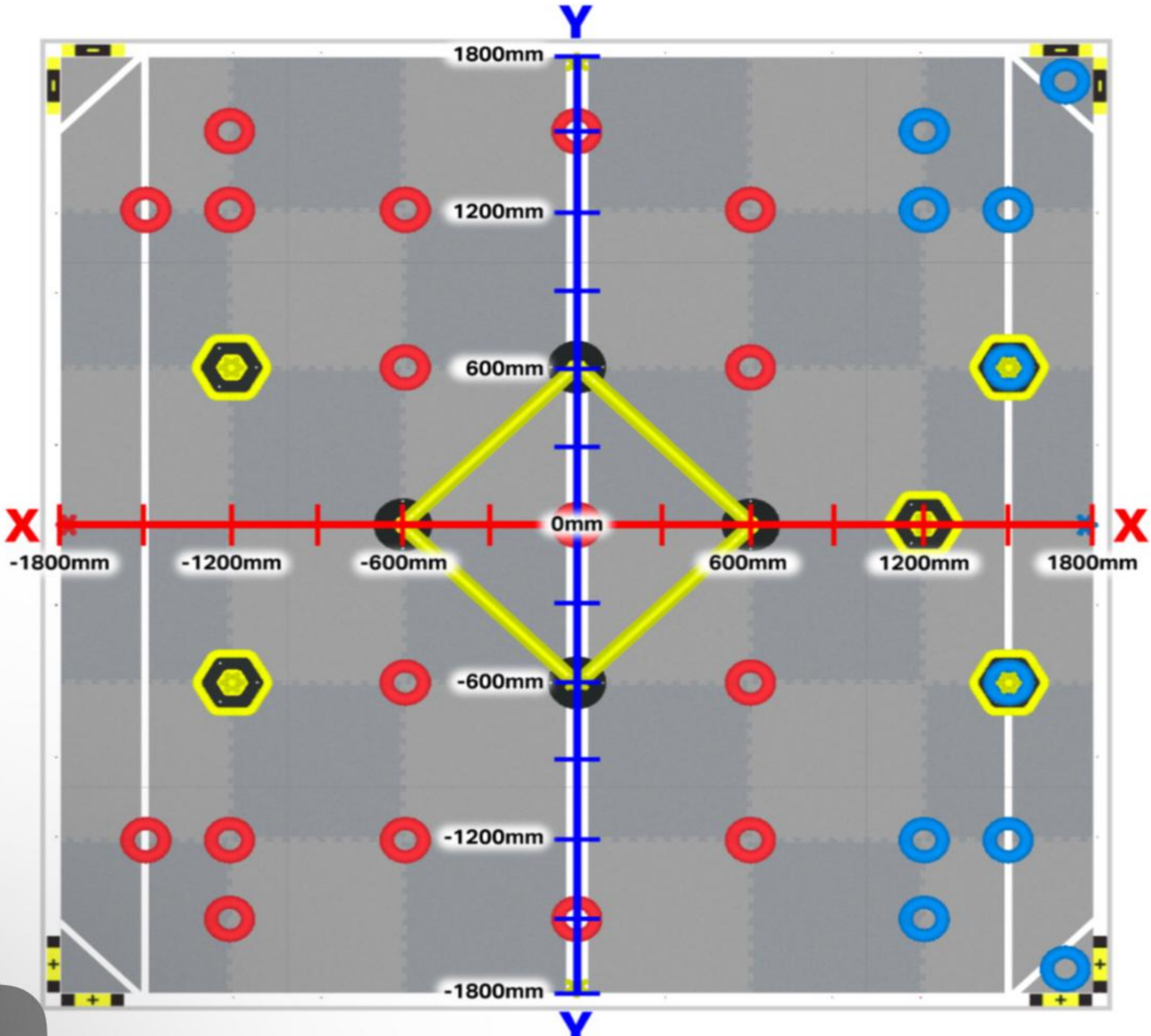


Phase 4

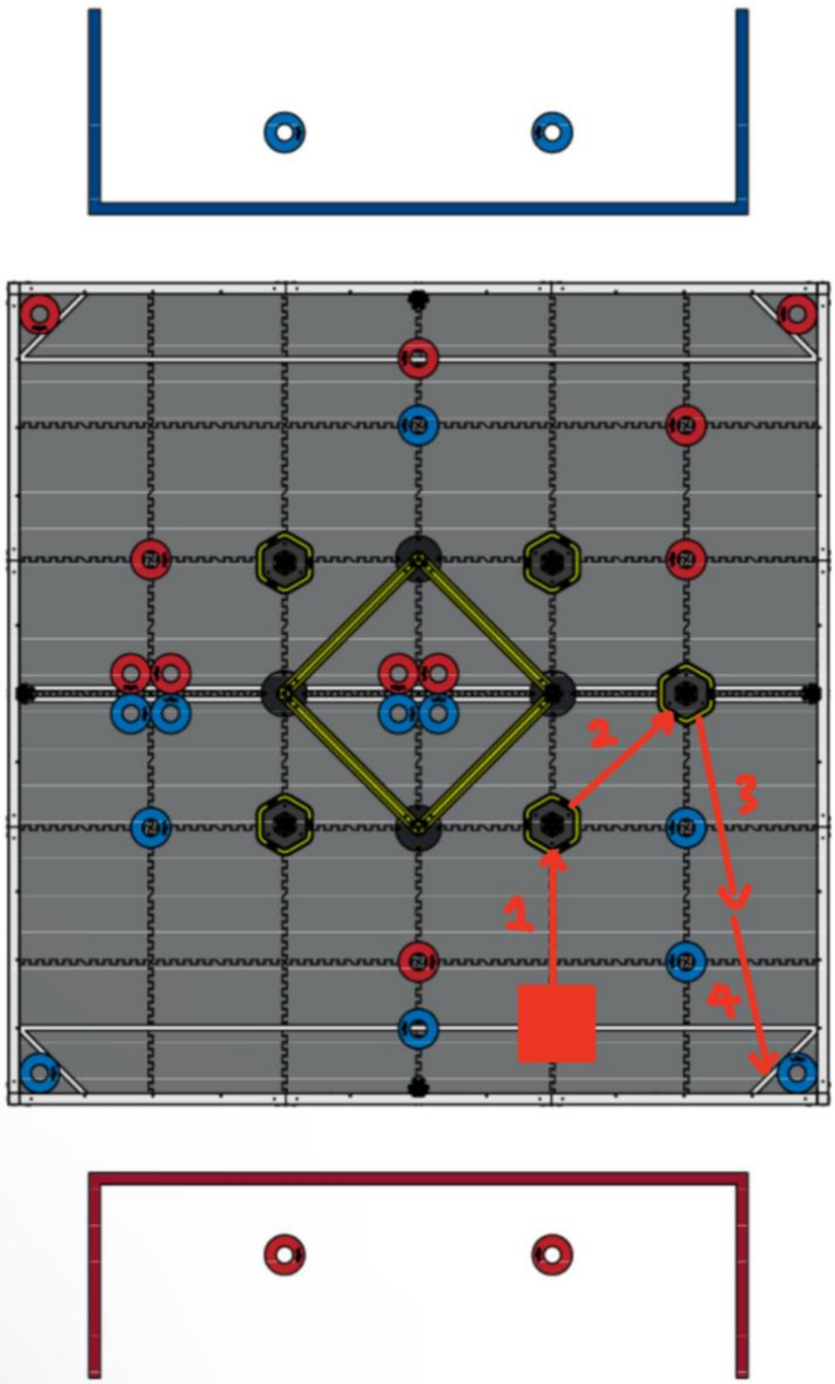
(5 points)



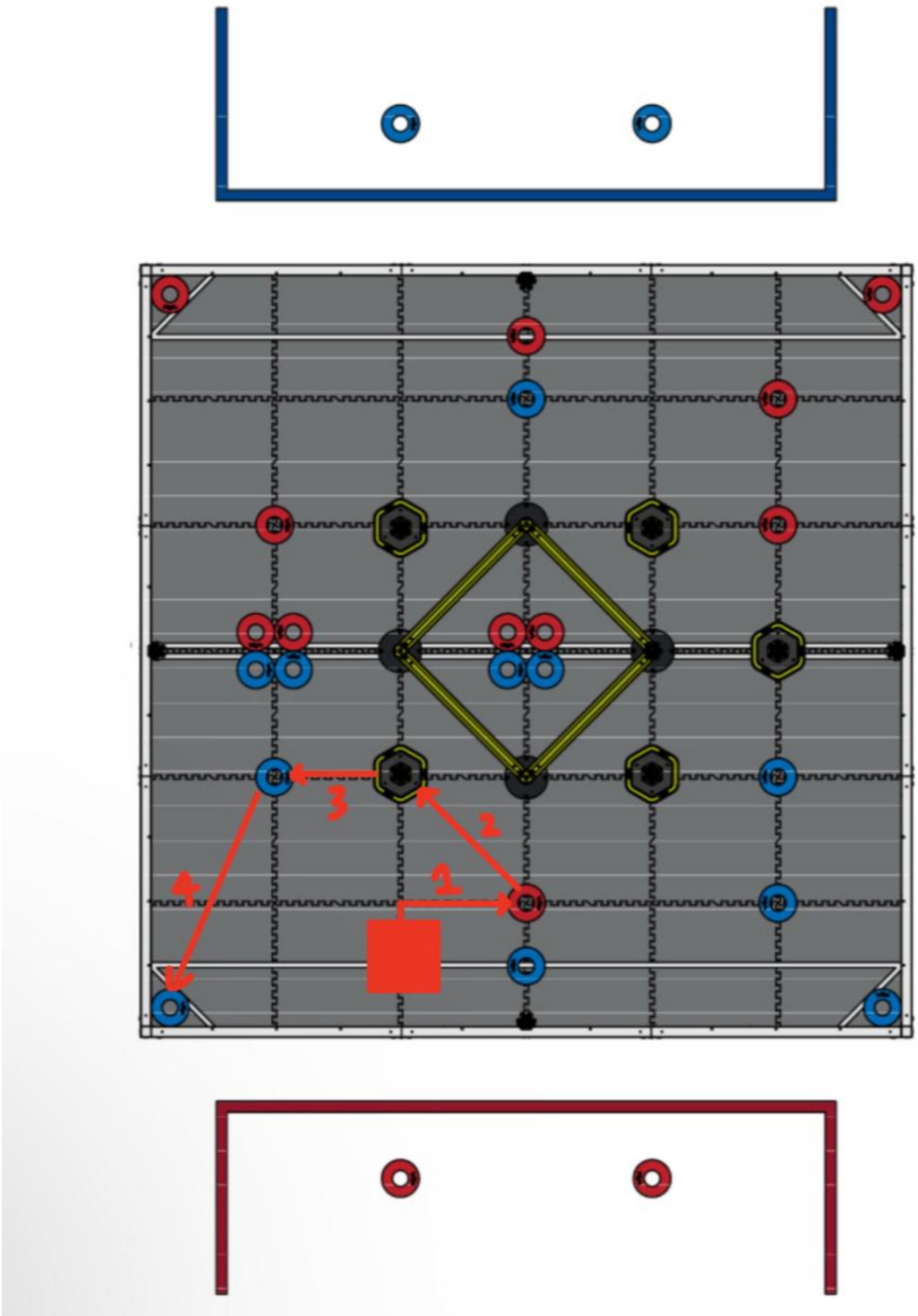
x-y coordinates we are using for skills auton but in inches



allience auton red-right



red - left



Calendars

September 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Start of vex	Important info			
		Game overview	Kit overview			
		Other info				
	Kit handover	Designing start	Design finalized for drivetrain			

October 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Drivetrain building	Drivetrain building	Drivetrain testing and fixes		
		Meeting day Belt design	Meeting day Belt design			
		Meeting day Belt building	Meeting day Belt building			
		Meeting day Testing belt	Meeting day Fixing errors			
	Thanksgivin g break worked at home	Thanksgivin g break worked at home	Thanksgivin g break Worked at home			

November 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Meeting day Belt and intake design	Meeting day Belt design			
		Meeting day Belt building	Meeting day Belt and intake building			
		Meeting day Testing belt	Meeting day Fixing errors			
	Thanksgiving break worked at home	Thanksgiving break worked at home	Thanksgiving break Worked at home			

December 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Meeting day Intake design	Meeting day Intake design			
		Meeting day intake	Meeting day intake		Working on bot at home	Working on bot at home
Working on bot at home			Working on bot at home			Working on bot at home
	Working on bot at home			Working on bot at home	Working on bot at home	

January 2025

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			Winter break (work from home)	Winter break (work from home)	Winter break (work from home)	Winter break (work from home)
Winter break (work from home)	Winter break (work from home)	Meeting day Coding	Meeting day Coding			
		Meeting day Coding	Meeting day Coding			
		Meeting day Testing	Meeting day Editing code			
		Meeting day Last changes	Meeting day Last changes			

February 2025

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Meeting day	Meeting day			
		Meeting day	Meeting day			
		Meeting day Planning	Meeting day Drive Train			
		Meeting day Conveyor Belt	Meeting day intake & pneumatics			
		Meeting day Driving Practice	Meeting day Auton Final Testing			State Competition