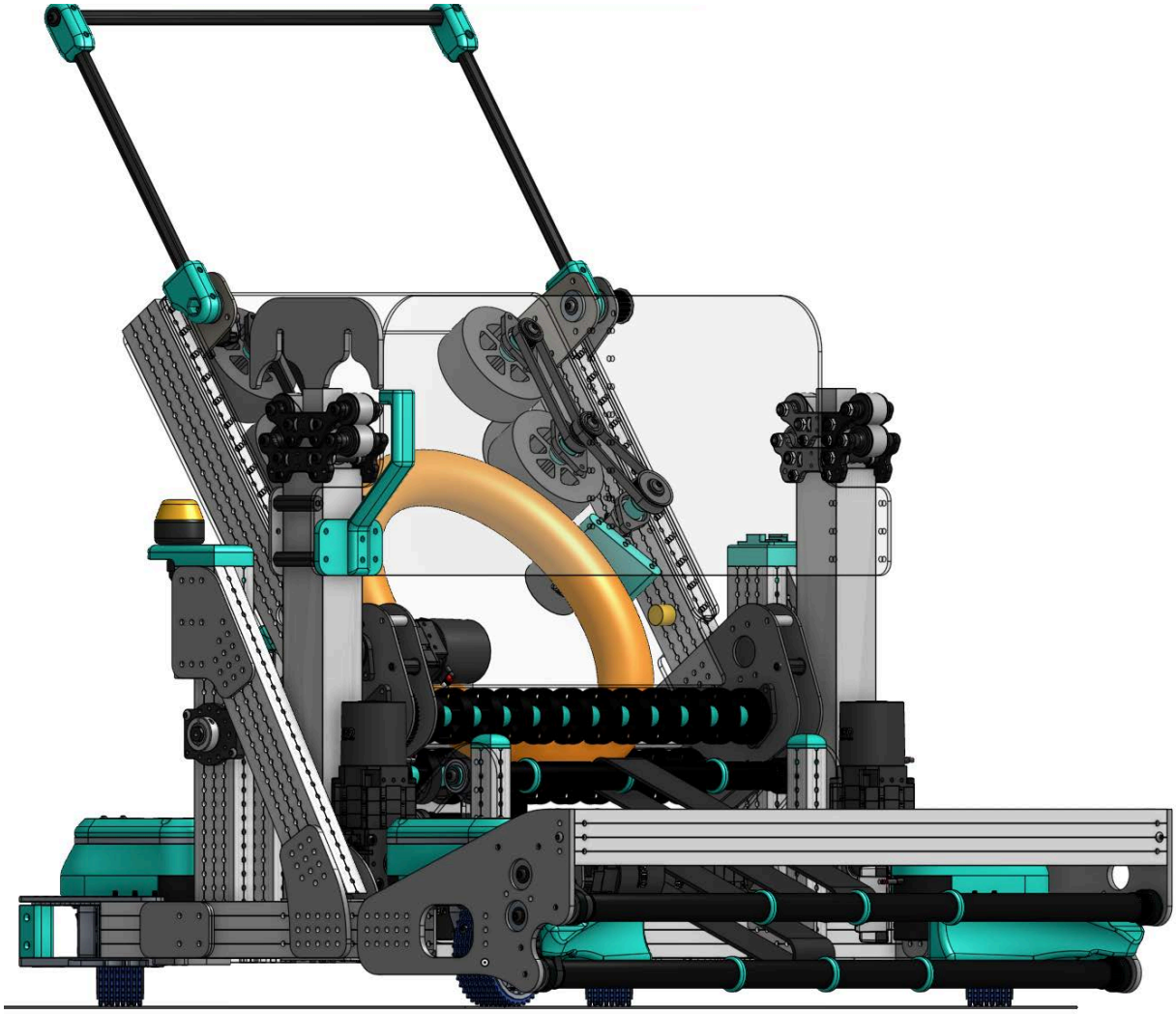


DIDELPHIS

Engineering Notebook

FRC 2718

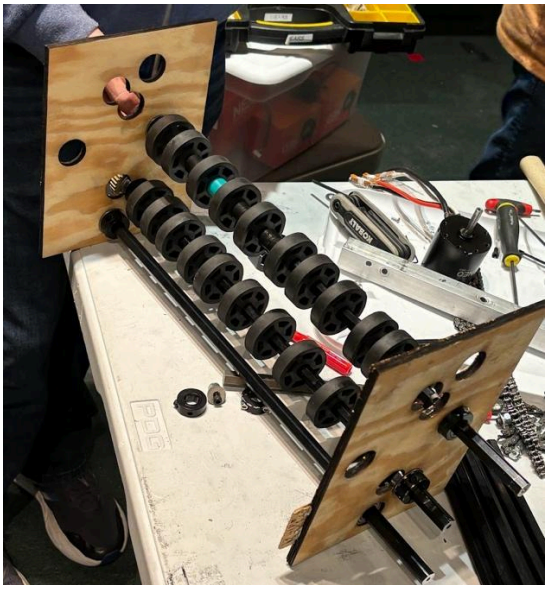
Team OKC e’possums

Research

During kick off we began by separating the team into key elements that we believe the robot would be made up of. The drivetrain, shooter, and intake were going to be key to a successful season and could not be overlooked. The groups would begin with very simple and quick sketches and ideas of how each section would function. After the groups had enough time to thoroughly explore and work through some of the challenges that we would face we came together to speak about what we have found and a couple plans to execute them.

Develop

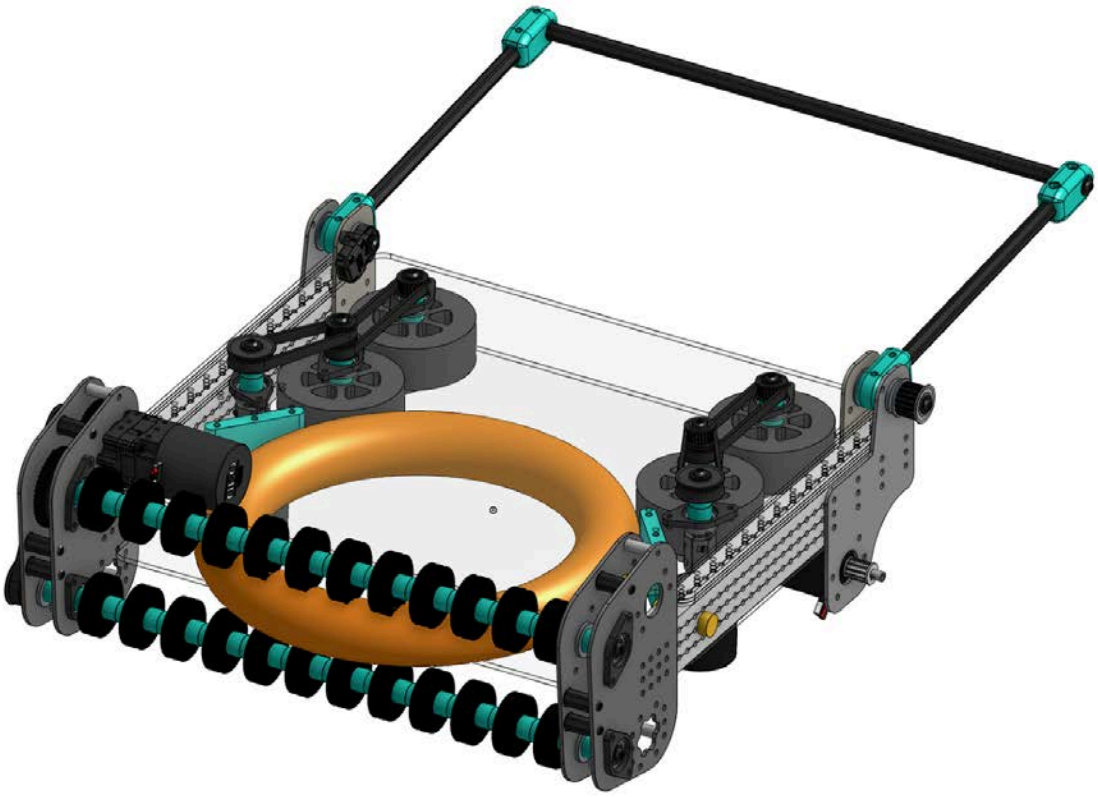
With the power and efficiency of a newly acquired laser cutter we were able to prototype compression, grip of materials, and spacing for motors and electronics. The key here was to use our research as a launch pad and began to find measurements of the robot and its subsystems. We were able to run simulations of each subsystem with the use of minimal materials by reusing discarded material from previous robots such as extrusion and hex shaft that was oversized yet worked well for the task of testing. By this time the team working on field elements such as the speaker were finished to where we could test distance and angles of our shooter without having to dedicate much time to producing a massive assembly.



Testing

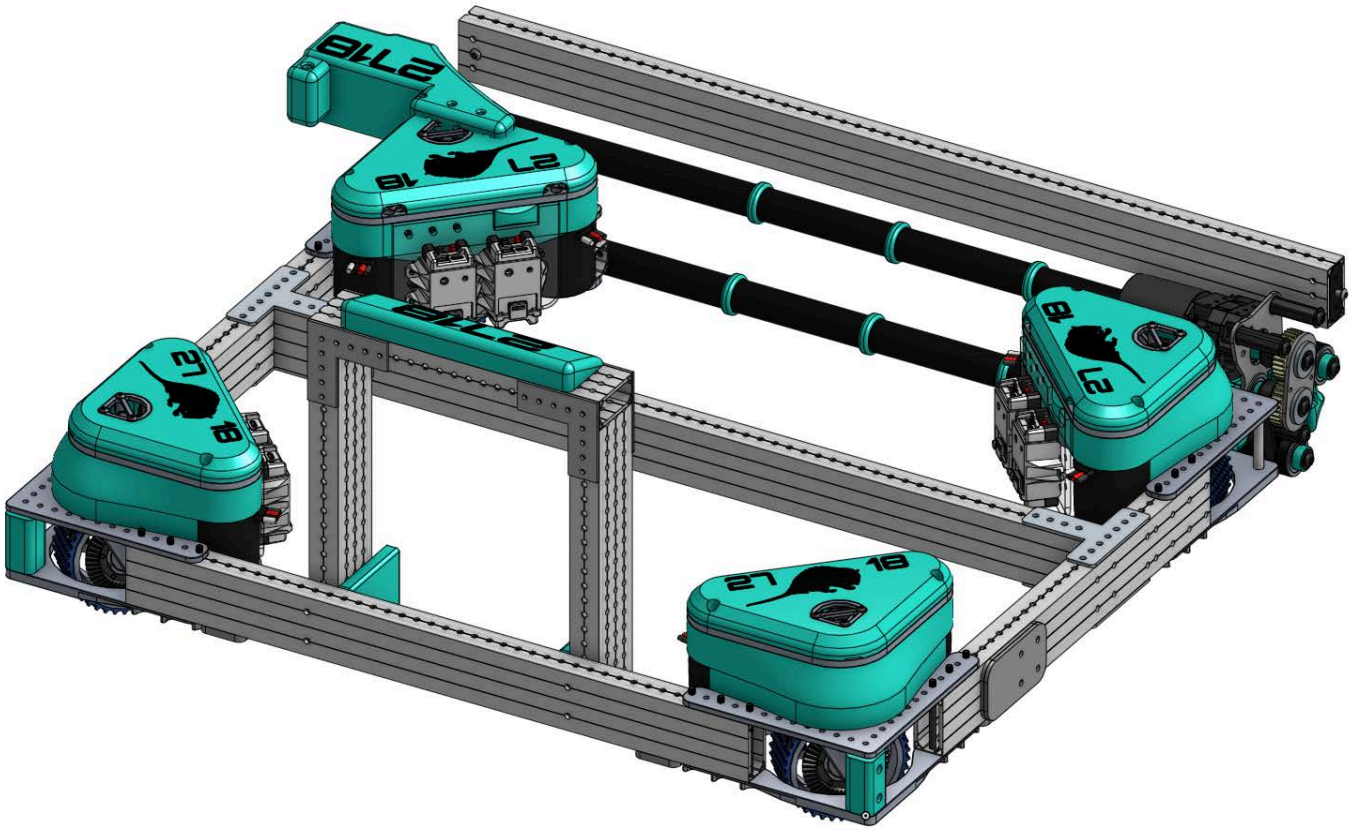
Shooter

Designed with versatility in mind we made the entire shooter rotate on a pivot. This allows us to shoot from theoretically any distance and incorporates a primer location where the notes are situated within the robot with the index wheels which hold the note despite the angle that we are shooting at. This makes it easy to ready a shoot as soon as we are auto locked or at the subwoofer. We are also able to pass across the field with the range we incorporate of 30-60 degrees relative to the ground. The compression on the notes is 6 in allowing for a stronger and more accurate shot despite the damage to the notes. We also have a shooter from the side where we are able to give spin for the notes if necessary but allows for less variability due to different speeds of the fly wheels which can become an issue with a shooter with wheels on the top or bottom.

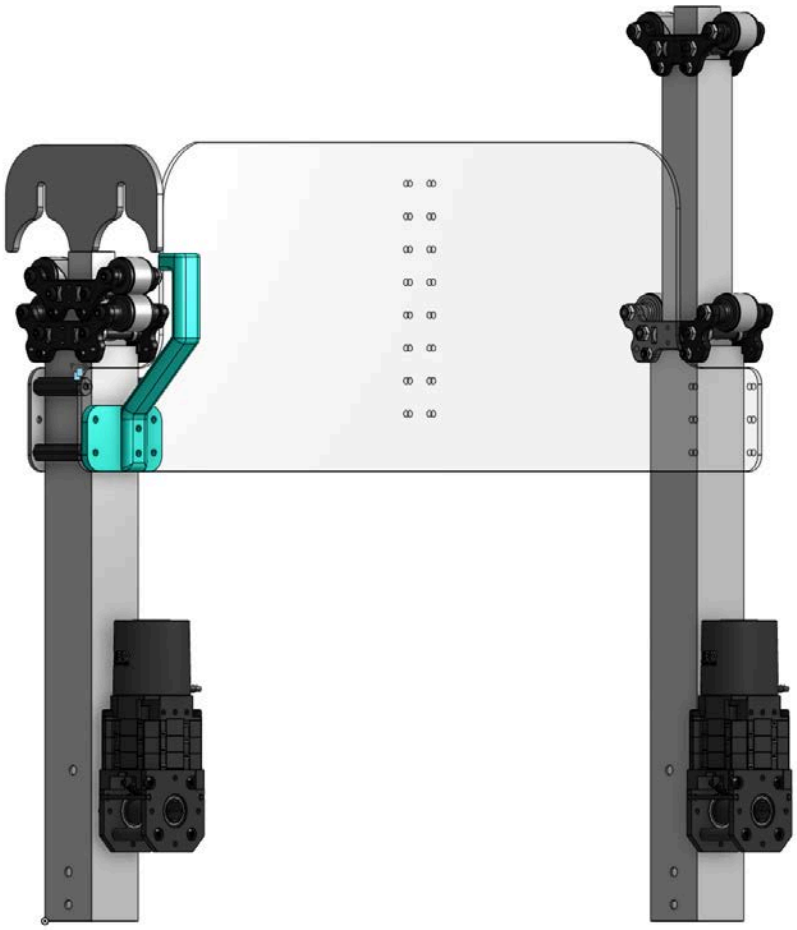


Drivetrain

A drivetrain that was made to take hits and last through multiple competitions with minimal repairs. This was a focus due to a lesson last season where we had our frame cave in on itself rendering us disabled. This was fixed with more robust extrusion and the use of stronger brackets at every point that we could. The intake was also incorporated into the frame which allows for a solid and quick pick up without having to get an intake position prior to grabbing a note. This was easily done with a under the bumper intake that had lots of support from ¼ in brackets to have a very durable and reliable robot.



Hanger

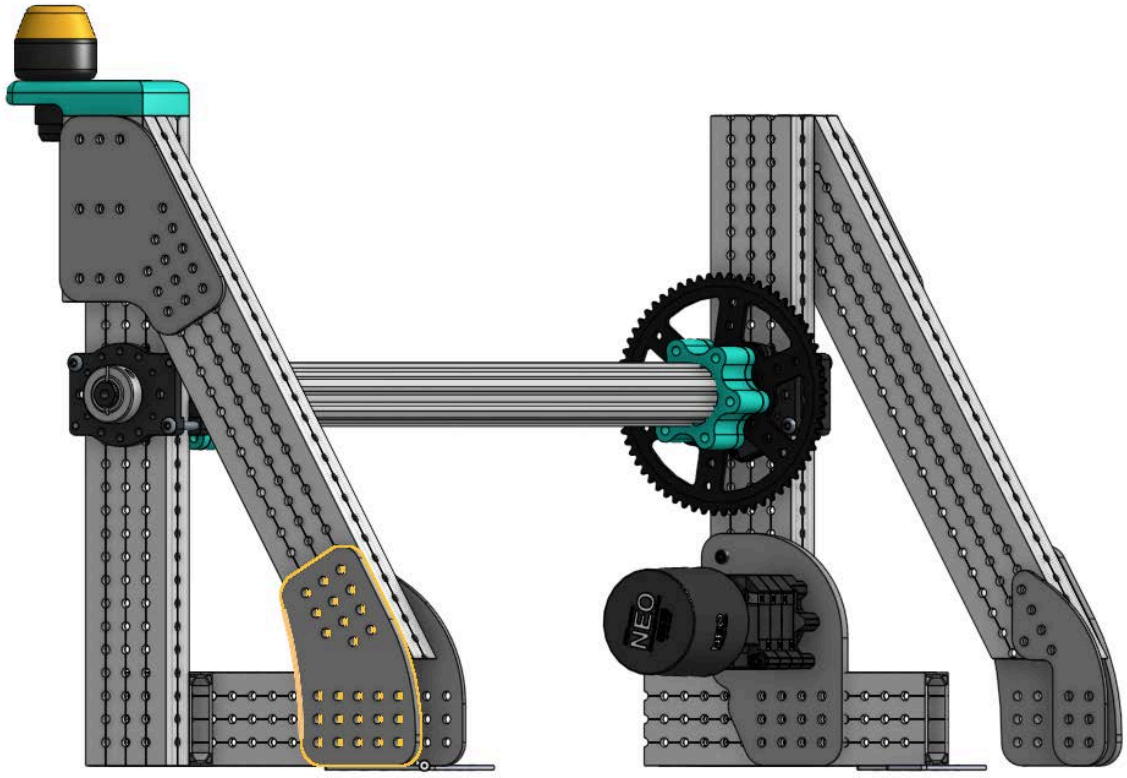


We used Thrifty bot climbers with significant modifications with motor mounts allowing for a lower profile and addition of easily adjustable gear boxes. To maximize speed we needed to lower the gear ratio as low as possible with the motors in brake still allowing for the climbers to hold the robot's weight. The use of the plexiglass allows for the addition of a mounting for cameras, radio, and most importantly sponsors. This gives a high and organized space for anything that needs to be mounted out of the dense center of the robot. From here we have a 3d printed limit switch mount that is pliable so that the climbers don't destroy themselves or the limit switches when lowered further than expected. The hook is designed to catch the chain and

stay on one link by trapping it in the divot and makes harmony efficient and simple.

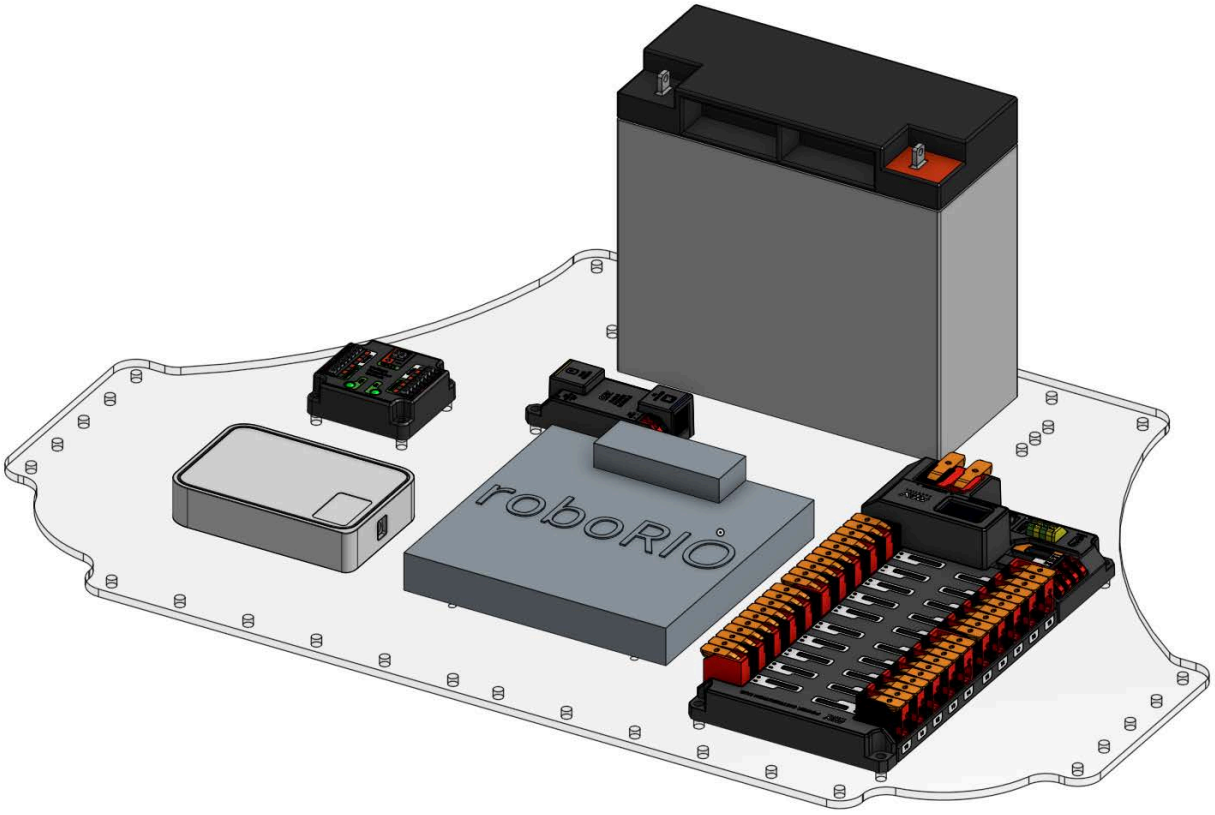
Pivot

The pivot is vital and essential to the use of the shooter and indexer. Without the use of the pivot we are forced to play defense and climb so this is a major part of the robot. We designed the pivot to be able to shoot from near and far distance from the speaker, as low as 30 degrees, as well as a high angle of 60 degrees to allow for Amp scoring.



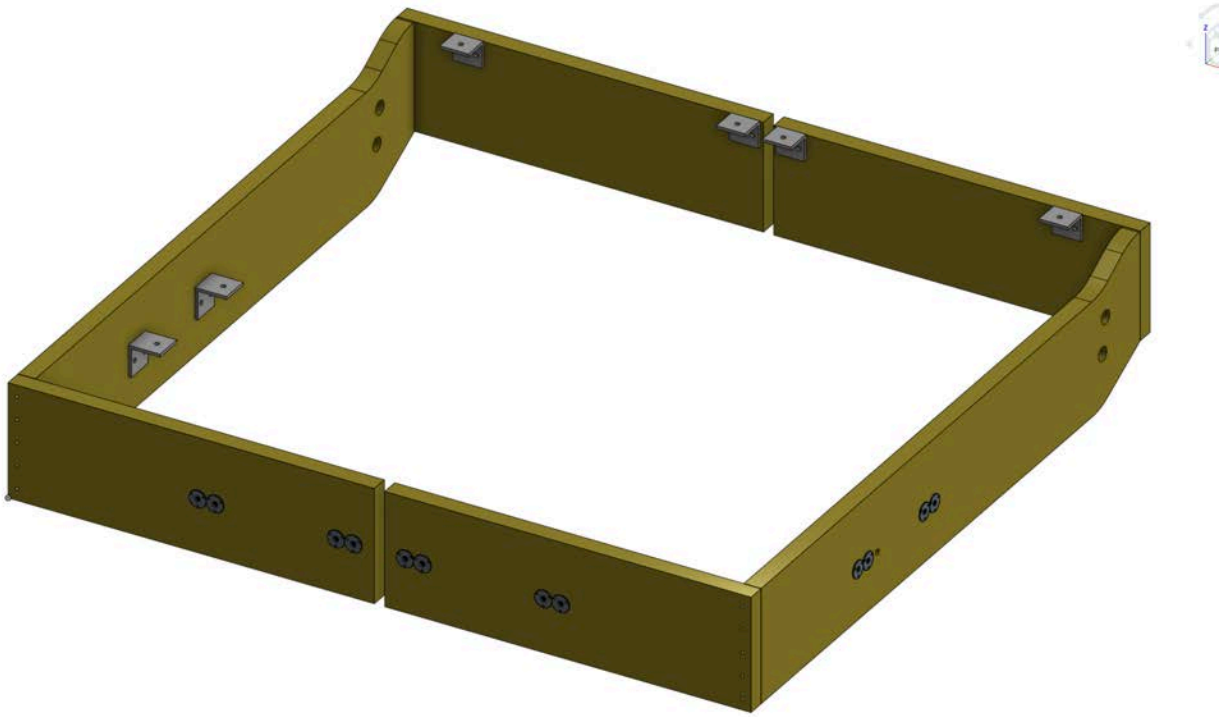
Electrical Panel

Our electrical panel is designed to be removed or dropped from the robot if any major repairs need to be made. It is placed in an area where it will not easily take damage during impact on the field. One challenge we faced this year was the size of our electrical panel. However we overcame this challenge by getting creative, using zip tie pads we were able to better manage the wires connected to the panel by keeping them in organized groups. Something you'll notice when looking at our panel is we have three DB9 connecters, we are using these to help power our sensors which opens up extra ports on our RoboRio.



Bumpers

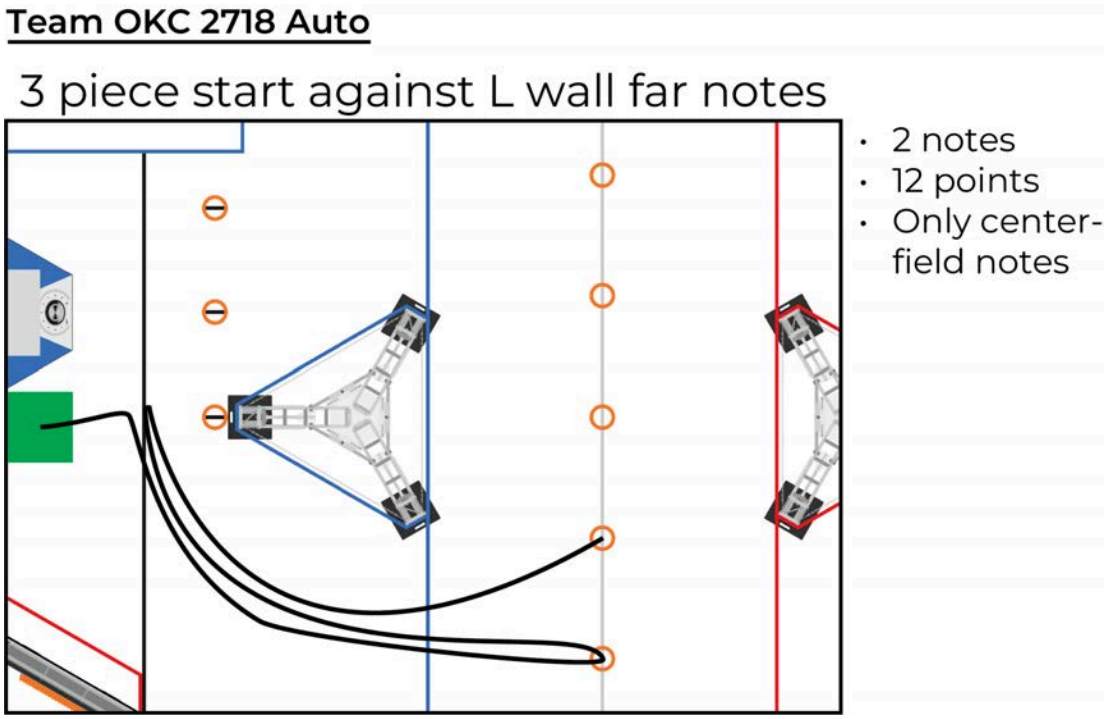
This year we decided to try something new with our bumpers. We knew we wanted an efficient way to intake notes during our matches so we decided to go under the bumper. This meant we now how to figure out how to make a legal bumper that allowed for a note to pass under it. You'll notice the front of our bumpers are at an upward angle, by doing this we are able to have a successful intake in which the bumper does not interfere and the entire side of the bumper is lifted to allow a wider intake area and not an exact line up for grabbing notes.



Programming

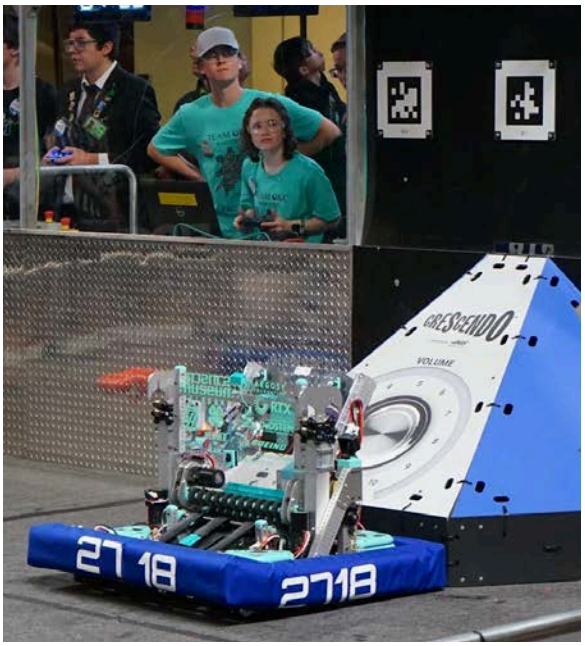
Autonomous Code

This year, we implemented pathplanner so we could easily program different autons. We have autons that don't use AprilTags and come back to the speaker to shoot. We also have autons that use auto aim to track the april tags on the speaker, so we can easily shoot the notes from different positions on the field during auto to remain out of the way of our alliance members.



Auto Aim

We use auto aim to adjust our pivot and position of the robot relative to how far away we are from the speaker AprilTags. Our auto aim code has different setpoints for the pivot at certain distances, and uses linear algebra to figure out the best setpoint when we are between distances. Auto aim also uses the April Tags to detect if it is lined up with the speaker, and will adjust the yaw of the robot if it is not lined up. The code also locks out the first driver's ability to turn when auto aim is on, so they cannot accidentally move the robot after it is lined up.



Coming in at the blue corner at a steep 26 inch tall and 130 lbs. Don't forget the staggering girth of the robot of 30x28 inches just 4 inches within the dimensions and all others lie dead at the sight of **Didelphis**!