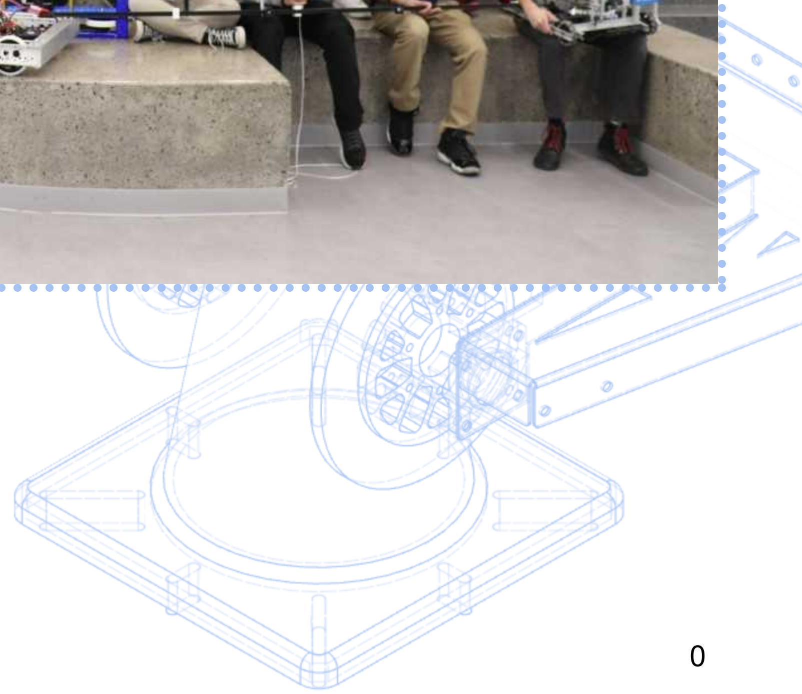
Vanguard High School
9034
The Space Dolphins



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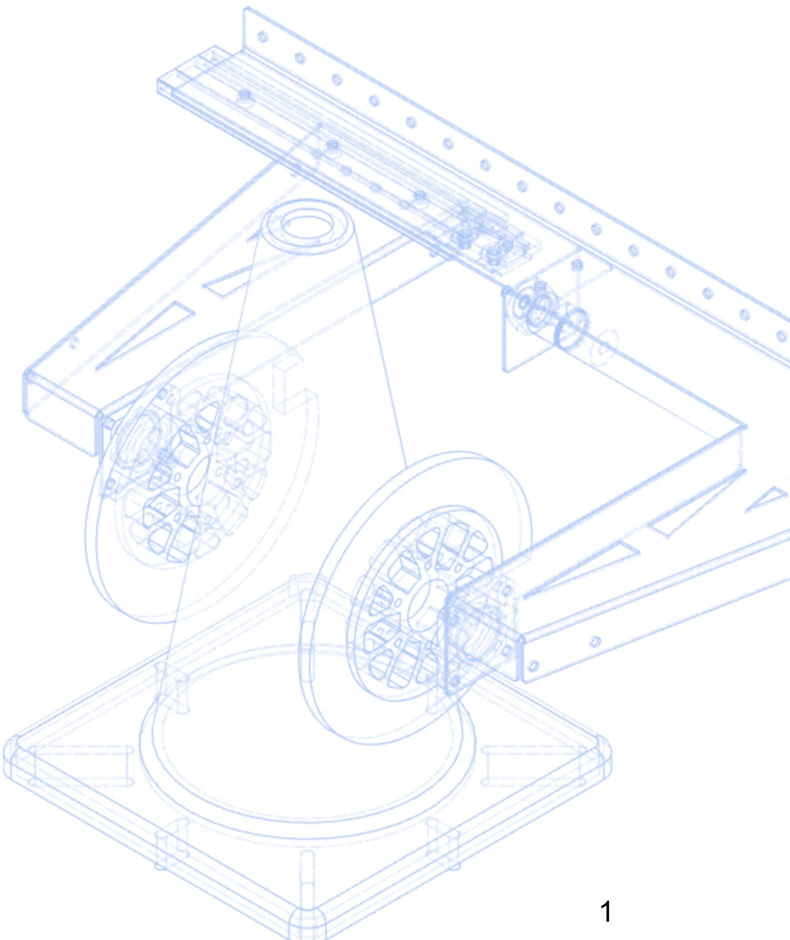


Outreach

Our robotics group at Vanguard High School had a summer camp for 1st through 7th graders. The camp helped engage kids in stem related activities such as coding, building, learning to use 3D pens, 3D modeling, and building mini rocket ships.

On the first day, we played interactive games to help engage them into learning each other and team work skills. Afterwards we did some beginners coding with a game to help them understand simple programming.

On the second day we set up our 3D pens and they built their own structures like the eiffel tower, bridges, and even made glasses they could wear.

The third day was when we built mini lego robots and programmed them to move with controllers. The kids had to first code what they wanted their robot to do with their command and then focus on a way to make a suitable robot design and build it.

Read Play Talk was basically where we usually would talk to kids on the usual things we do in robotics. We brought 2 clawbots to let the kids play around and drive them. We also brought 3D prints we made and the rockets we built from the summer camp.

We also went to Achziger and Gray Elementary to present to all grades about the robotics program in Vanguard and what we do on a daily basis.

Team Lead Roles

Our pit team members are Asha Smith, Alexa Chavez, Elijah Peele, Caiden Bendorf , Ricky Avila , Guillermo Trujillo, and Michaelangel Nieves.
Pit team members are in charge of fixing and adjusting the robot throughout the matches.
Asha Smith will be our student coach where she will focus on directing the drivers and making sure everyone is on check. Caiden Bendorf will be our main driver with Elijah Peele as our backup driver. Guillermo Trujillo will be our operator which will focus on setting up and repairing equipment or machinery if needed. Alexa Chaves as our safety captain and human player and Ricky Avila will sustain and upkeep with our bumpers.

Alexis Torres and Daniel Al-kabi will be our backup crew in case one has to back out.
We will also have others who will help with alliances and cheer for our team.

Pit Team

Ricky Avila

-Bumpers maintenance
-Mascot

Guillermo Trujillo

-Operator
-Co-Programmer

Asha Smith

-Student coach
-Designer

Elijah Peele

-Co-driver
-Builder

Caiden Bendorf

-Main Driver
-Main Programmer

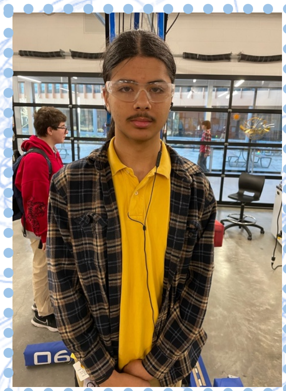
Alexa Chavez

-Safety captain
-Human player

Michaelangel Nieves

Alexis Torres

Daniel Al-kabi



Meet The Mentors!

Mr. Corrales

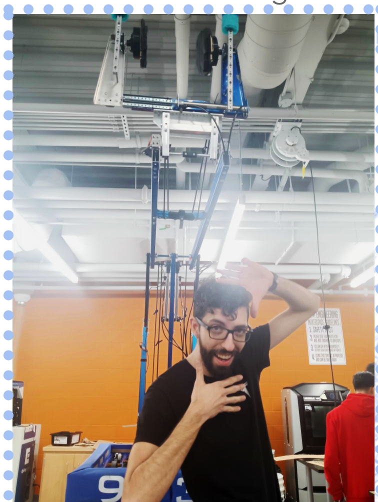
On the left is the Robotics teacher at Vanguard High School. Mr. Corrales has much importance in our lives as students, he has taught us how to be the greatest version of ourselves by educating us to be independent and solutionists while working together. We greatly appreciate what he does for us and look forward to continue learning.

Instructure

Mr. Gonzalez

Mentor

Mr. Holmburg



Lead mentor 2

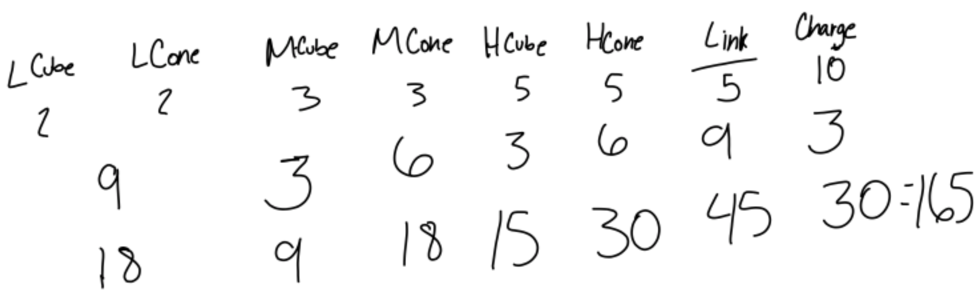
Ms. Corrales

Mentor

Engineering Process

Defining The Problem

Right after kickoff we started analyzing the rules, scoring methods, and dimensions. We discussed which methods will gain us the most points to help us better think of ideas. After Valeria set the weighted scoring matrix, we realized we needed to be able to score links at the highest level to optimize our points to processes.



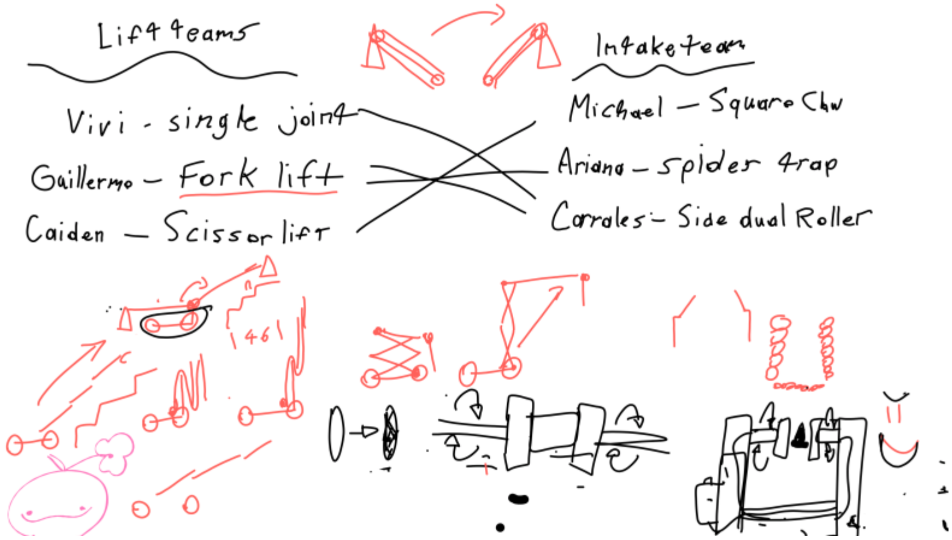
Brainstorming and Research

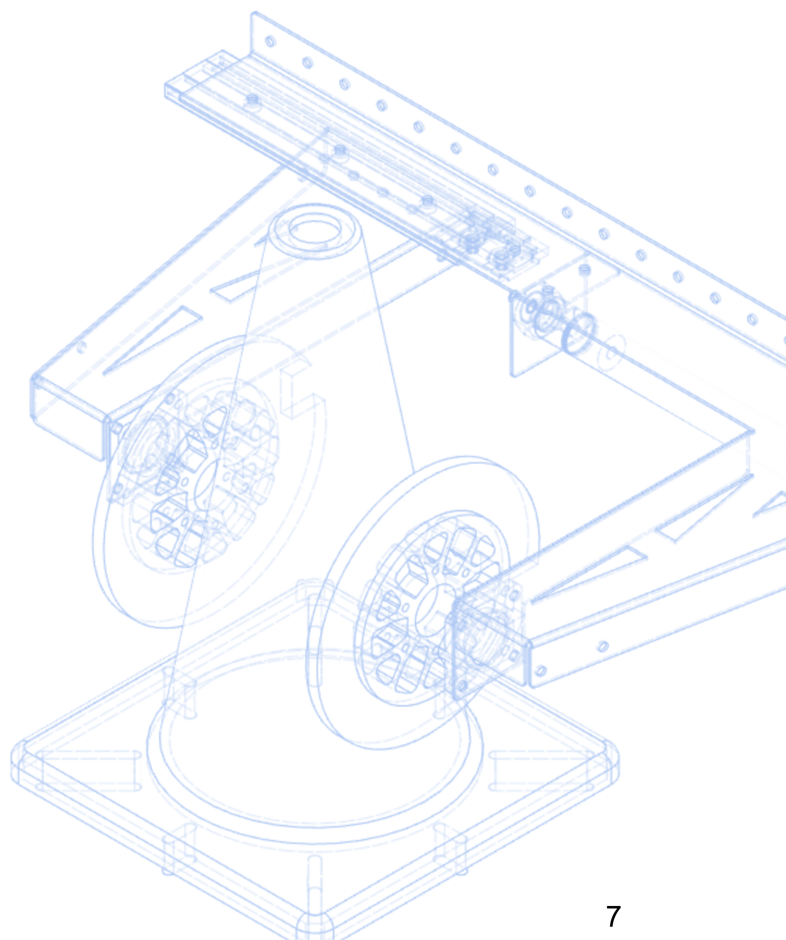
This is how we developed our designs. First, we broke down the robot into three subsystems: drive train, lift, and intake. All team members threw ideas on the board, no matter how efficient and posible it was. After each section was filled out with enough ideas we discussed the pros/cons of each design. A team of students reviewed the rules to help clarify the legality of designs and answer other student's questions. We went back through and voted which ideas would achieve our goals most efficiently and eliminated the rest.

This is the list of ideas we came up with:

DRIVE TRAIN	LIFT	INTAKE	INTAKE Pt 2
Square	Bottle flip	Basic claw	Ramp
Omni Wheels	Aerial ladder *	Candy claw	Human hand
	Fork lift *	Sticky arrow	Net
	Crane	4 pin claw	Spider trap
	Trampoline	portal	Spider #2 *
	Swing arm *	Linear claw *	Vacuum
	Elevator	Square claw	Suction cup
	Rocket	Ramp	Rollers
	Conveyor		Sideways rollers *

The main three ideas in each category were given design leads and a deadline of a week and a half to complete prototypes as a proof of concept. The design team leads are as follows:

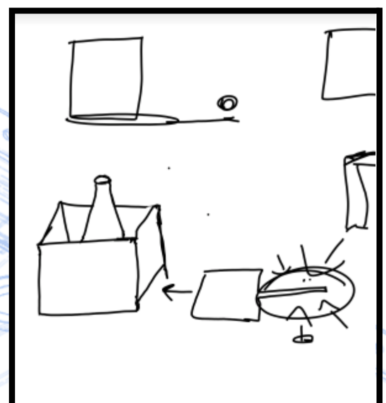




Subsystem Designs/Prototypes

Prototypes

Once the two weeks were done for prototypes we each tested our designs, we decided that a combination of the Aerial Ladder/Single Joint and the Pneumatic Linear Claw was going to be the best choice since they both worked efficiently and the other designs were discovered to have flaws.

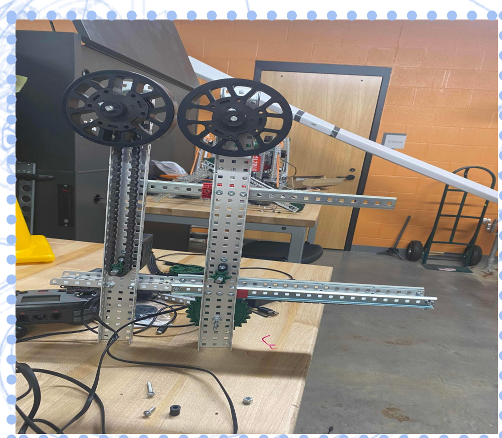


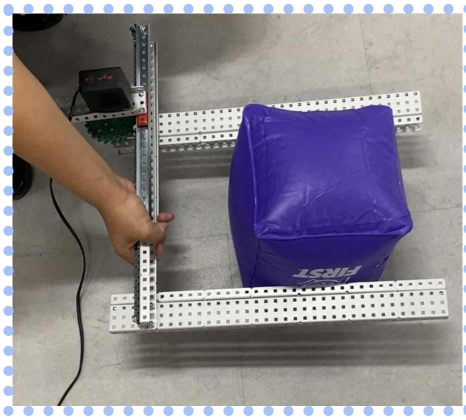
Spider Trap

The first completed claw prototype was Spider Trap, where a box is dropped on the game piece and a flat object is slid underneath to “capture” it. This design was scrapped due to it’s size and that it could only pick up the pieces from a single direction.

Dual Roller

The second design, dual roller, showed a lot of promise, but still required some sort of actuation to transition from grabbing cubes vs. grabbing cones. We scrapped this idea due to potential weight issues and over-complexity.

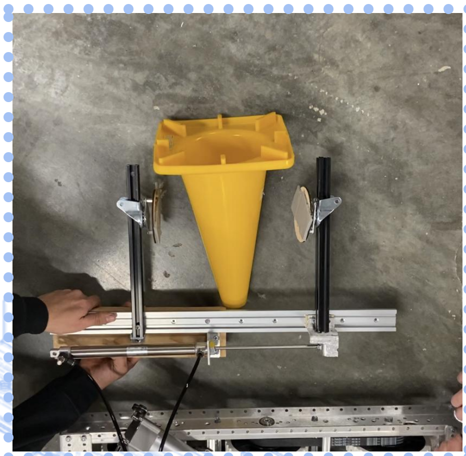




Motorized Linear Claw

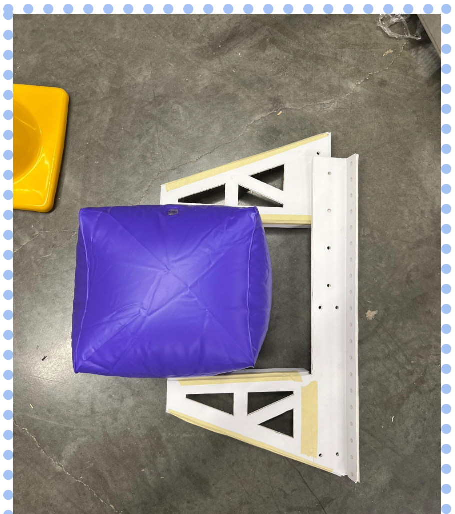
The second prototype idea for the new claw was the Motorized Linear Claw, that would grasp the cone and cube. The pro for this idea was that is was able to accommodate both the cube and the cone easily, but we still wanted to avoid having the weight of motors at the end of our appendage.

Pneumatics Claw



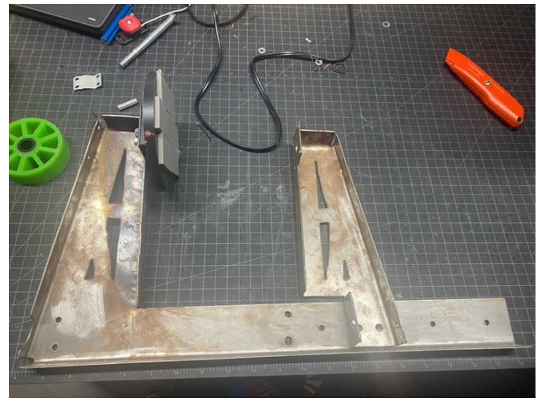
This gave birth Pneumatics Claw, this idea allows both the cone and cube to be grasped. The Pneumatic Claw doesn't require a lot of weight to do the task. It was also the fastest and allows the cone and cube to be grabbed in many different positions.

It also features pads on bearing that reorient the cone into scoring position



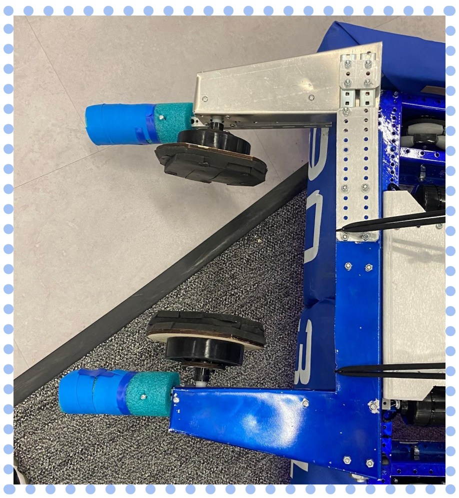
CADing the Claw

With this idea we were able to 3D design a model of our vision. This was the first design for the final claw, we measured the cube and the cone to make sure the new design would work for both efficiently.



Manufacturing the Claw

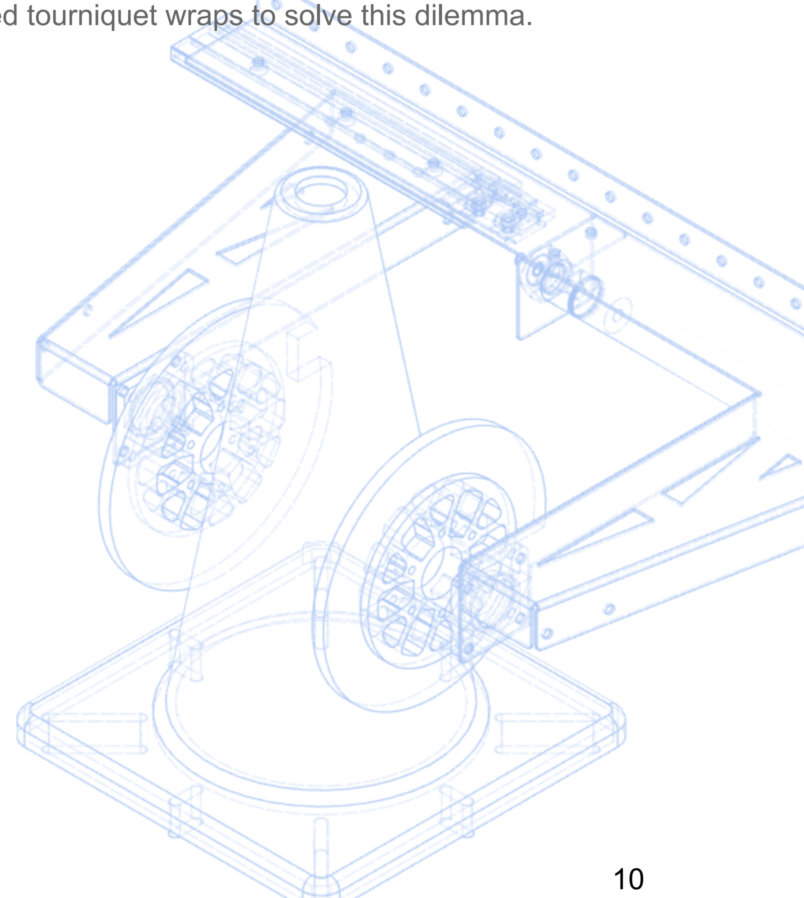
The design had multiple test phases, being made out of foam, then steel, then finally aluminum. Lebron was trained on a plasma cutter at a local Maker Space to cut the steel version.



Final Claw

Even after all the prototyping, when tested on the actual robot, we found that the cubes had to be in a certain position for our claw to work. We had a second brainstorm session and opted for an extension bar with pool noodles.

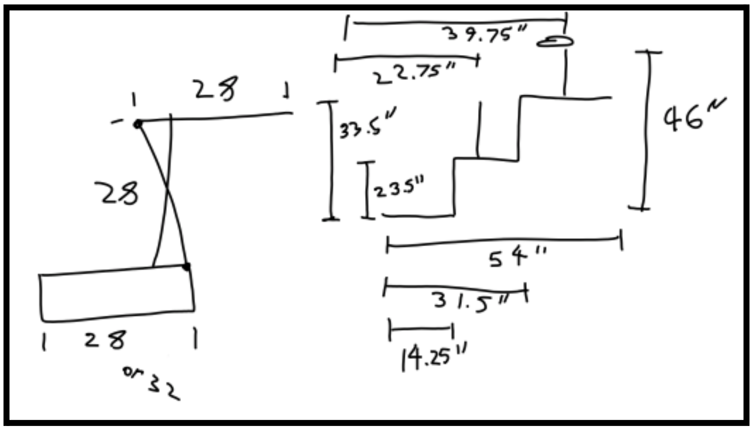
Fun Fact: When lifting the arm, the cubes sometimes still fell out. We borrowed tourniquet wraps to solve this dilemma.



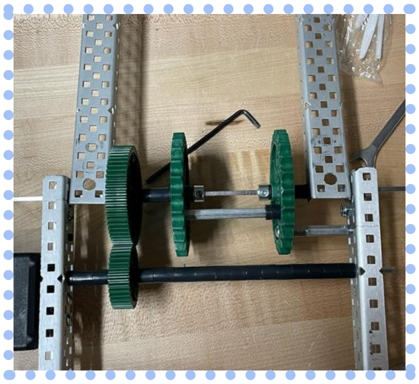
Lift

Scissor Lift

The scissor lift design was actually scrapped the day after brainstorming after we drew the field dimensions on the board. We realized horizontal reach would not be possible due to the size constraints of the frame without a second actuation.

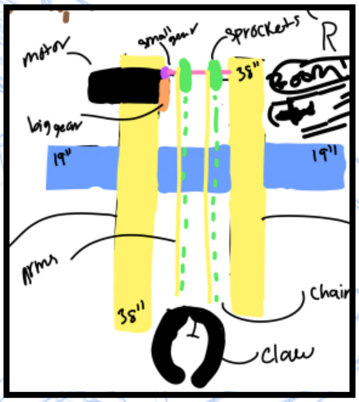


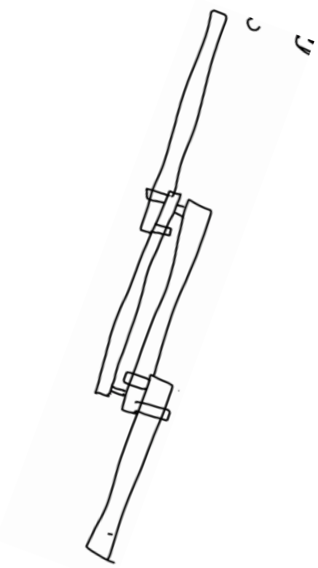
Single Join (Swing Arm)



Vivi created a prototype for this using a chain-bar linkage. This allowed the claw to stay in the same position relative to the robot. We eventually dropped the chain bar due to the claw we chose fixing this need by righting the cone using gravity.

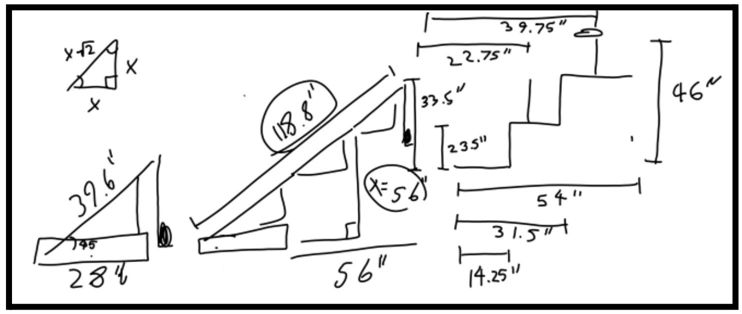
This design also had the pro of being simplistic and fiting the size constraints of the field elements and frame.

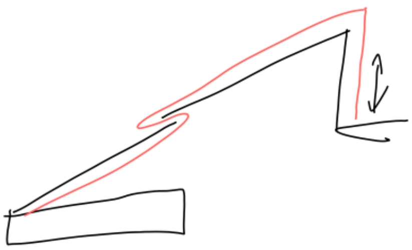




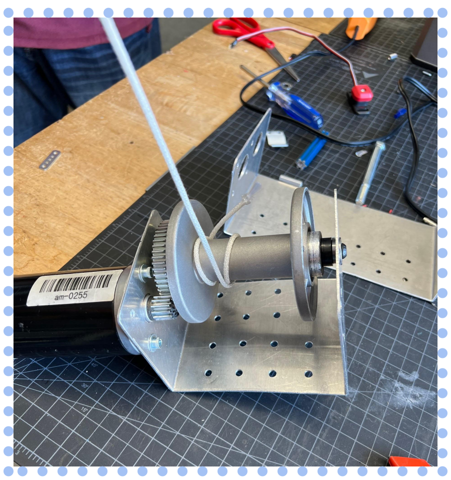
Aerial Ladder

The Aerial Ladder was headed up by Guillermo. This design is based on a fireman's ladder and is controlled by a winch system.





The prototype was made with 3D printed slide connectors and 8020 extrusions.Fou

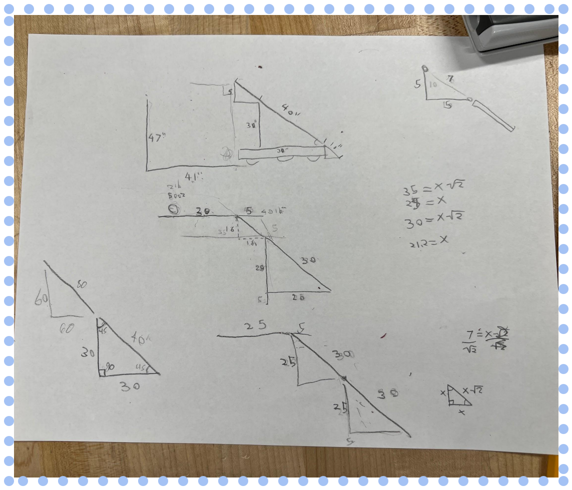


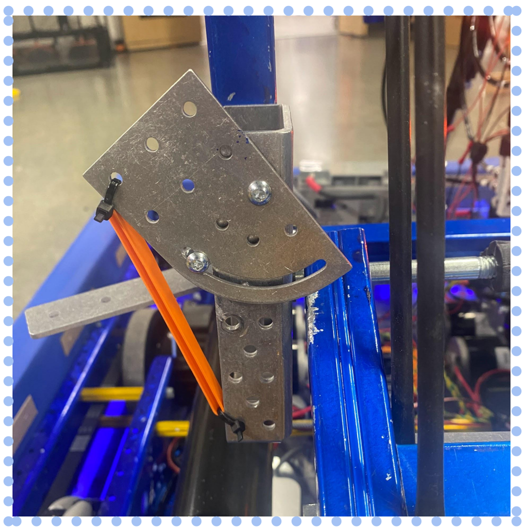
Final Lift Design

The final design ended up keeping elements from both the swing arm and aerial lift. We still used 8020 with slides to give us adjustable height, but put the swing arm joint at the end. We used 7 in pneumatic pistons to actuate the claw from lowered position to raised

Final Lift Continued

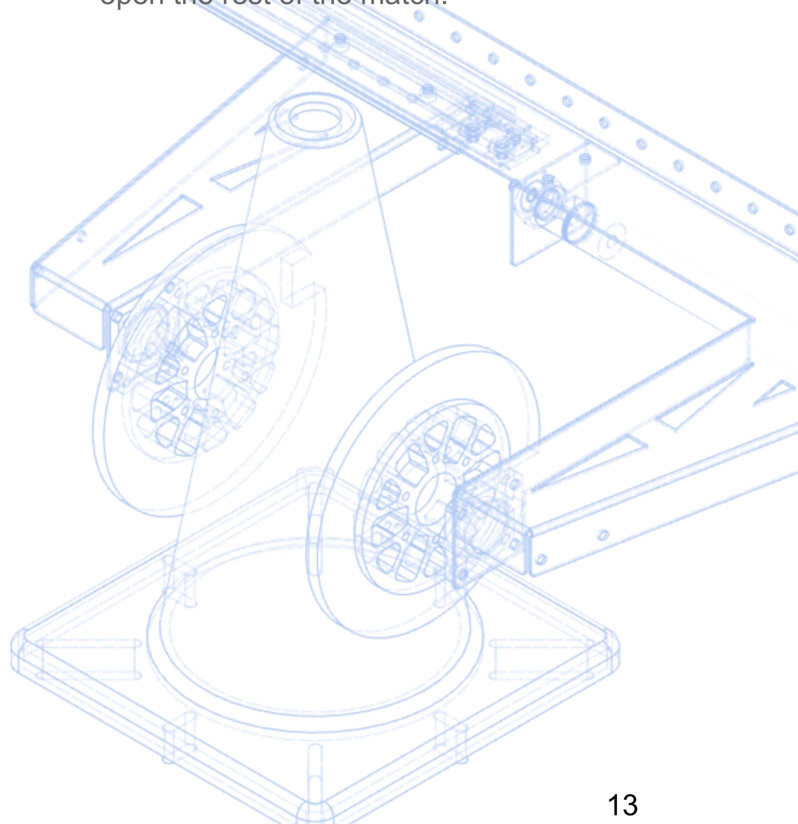
This required some heavy math to figure the lengths of arm and where the axis needed to be to lift the cone (Heavier element). We have about a 5:1 ratio across our arm (as a lever), so the cone plus claw went from a 5 lb. load to 30 lb. The math we did for two 7 in. piston said we could do about 40lb. So we were in business!





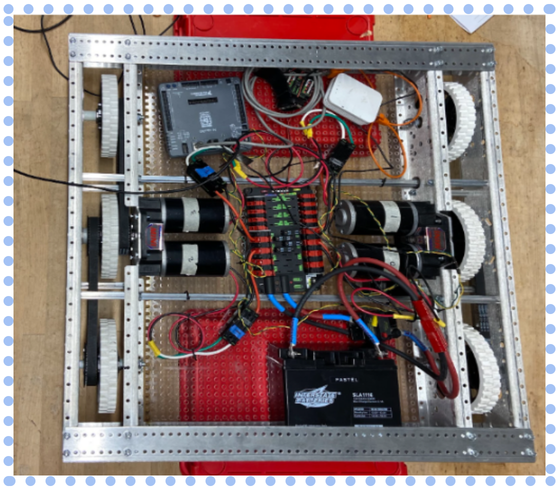
Integration Issues

When adding the final claw to our V2 arm, we ran into an issue. Whenever the arm raised, the claw would snap back into folded position. To fix this, we took inspiration from the one way latches on the school doors so that after the claw deployed, it stayed open the rest of the match.



Drivetrain

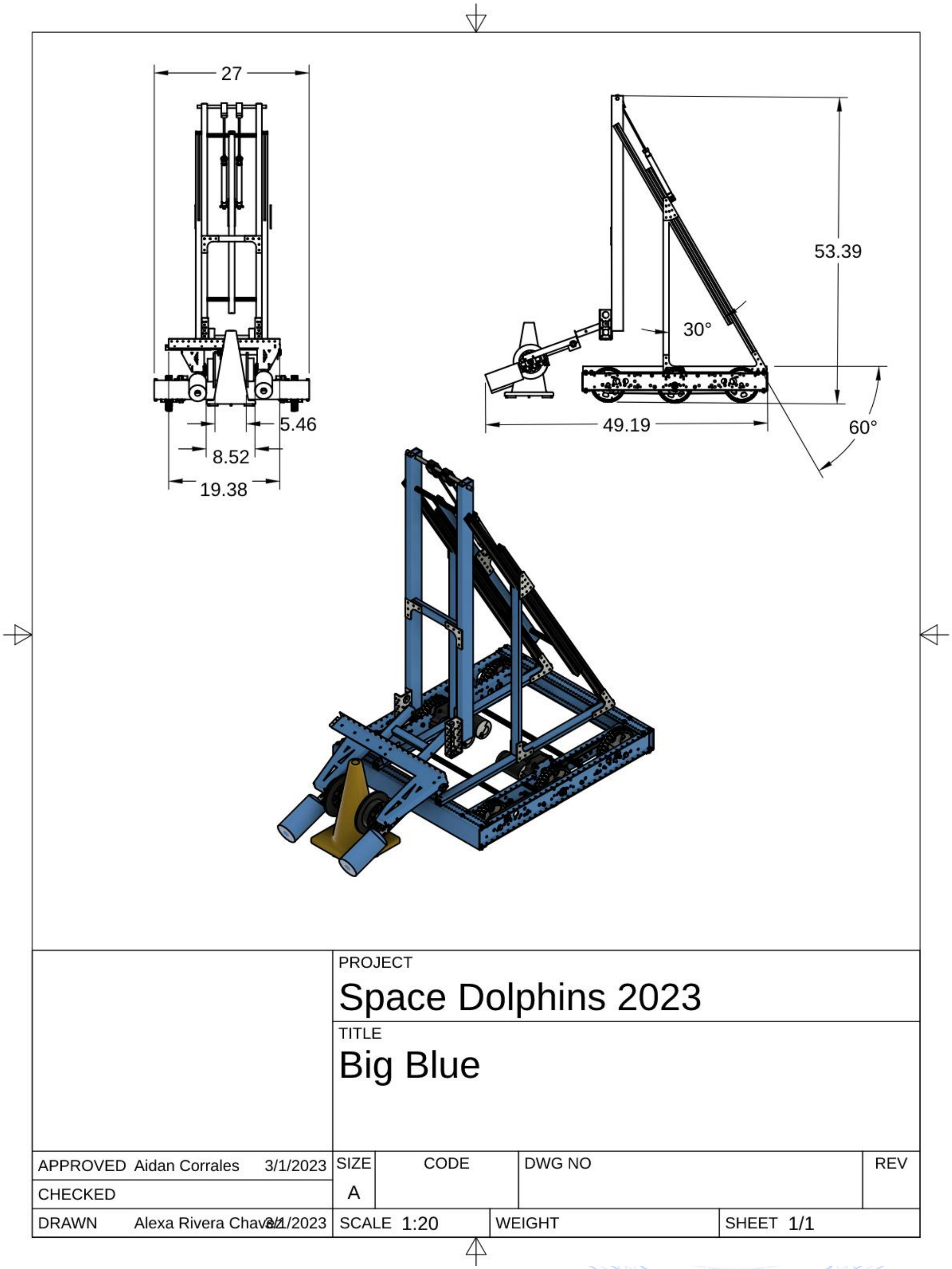
This is an image of our square chassis drivetrain build, 28'' x 28.3''. Originally we had all traction wheels but decided to change the wheels on each corner with omni wheels, this is because it allowed us to increase maneuverability without losing the traction to prevent other robots from pushing us.

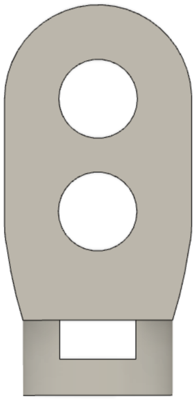


Final Drivetrain

This is a picture of our current and final drivetrain before we changed the wheels to omni wheels. The drivetrain is the Long Chassis build 32.3'' x 27''. We wanted to extend the drivetrain for balancing easier, and leave more space for the arm design.

CAD Designs


27
5.46
8.52
19.38
53.39
30°
49.19
60°
PROJECT
Space Dolphins 2023
TITLE
Big Blue
APPROVED Aidan Corrales 3/1/2023
CHECKED
DRAWN Alexa Rivera Chav 3/1/2023
SIZE
A
CODE
DWG NO
REV
SCALE 1:20
WEIGHT
SHEET 1/1

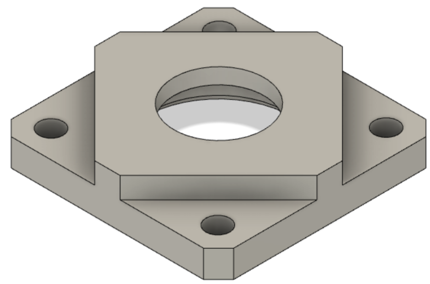


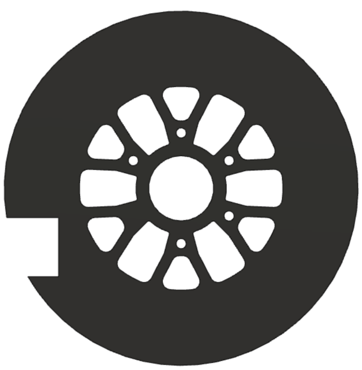
Karina Costilla's Part

Karina's Part helped us with the connection of the pneumatics and the extension bars of our robot acting as a lever for the top bars.

Alexa Rivera's Part

Alexa's Part helps with the assembly of the claw; it gives it space between the actual claw and the intake wheels.



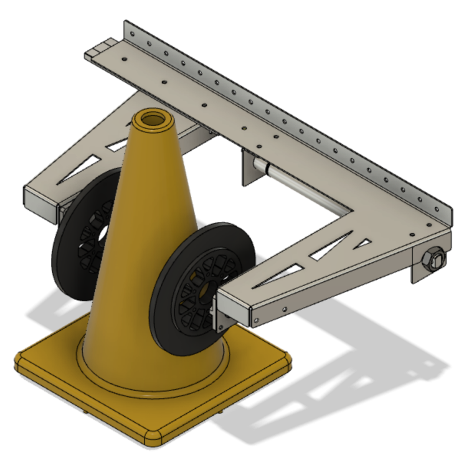


Asha Smith's Part

Asha's part is the main base of the wheels it helps by putting the claw into place by the hole made in the side.

Jefferey Velazquez's Claw Design

Jefferey's design of the claw gave us a better idea of how the claw was going to be manufactured, the original prototype was run by Lebron Santos in a plasma cutter in the makerspace



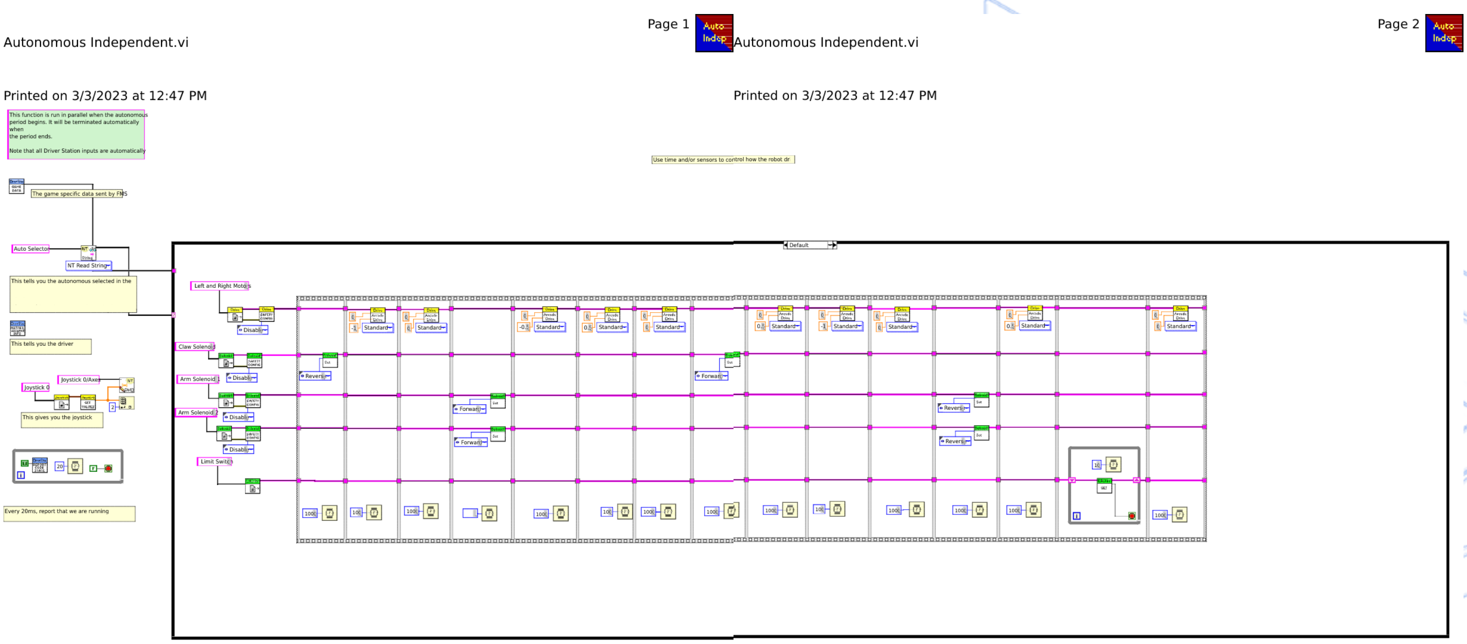
Programming

We were only able to complete our code thanks to team 358 Hauppauge Robotic Eagles. Their website helped us properly set up our limit switch, pneumatics, and motors. Caiden is our primary programmer and is working to train other students.

Due to a limited knowledge of programming with FRC, this year we set out to get a limit switch working. We built what is essentially a mechanical gyro that gets clicked when the robot experiences a sudden change in orientation or velocity. Our goal is for this to help us know when the robot is balanced.

The Auton Sequence is written to:

- Jog the drive to release the claw
- Toggle the arm pneumatics up
- Drive forward for a set time to the goal
- Release the claw
- Back up
- Lower the arm
- Back up until
- Limit switch is triggered
- Apply small amount of forward to the drive to stop while balanced



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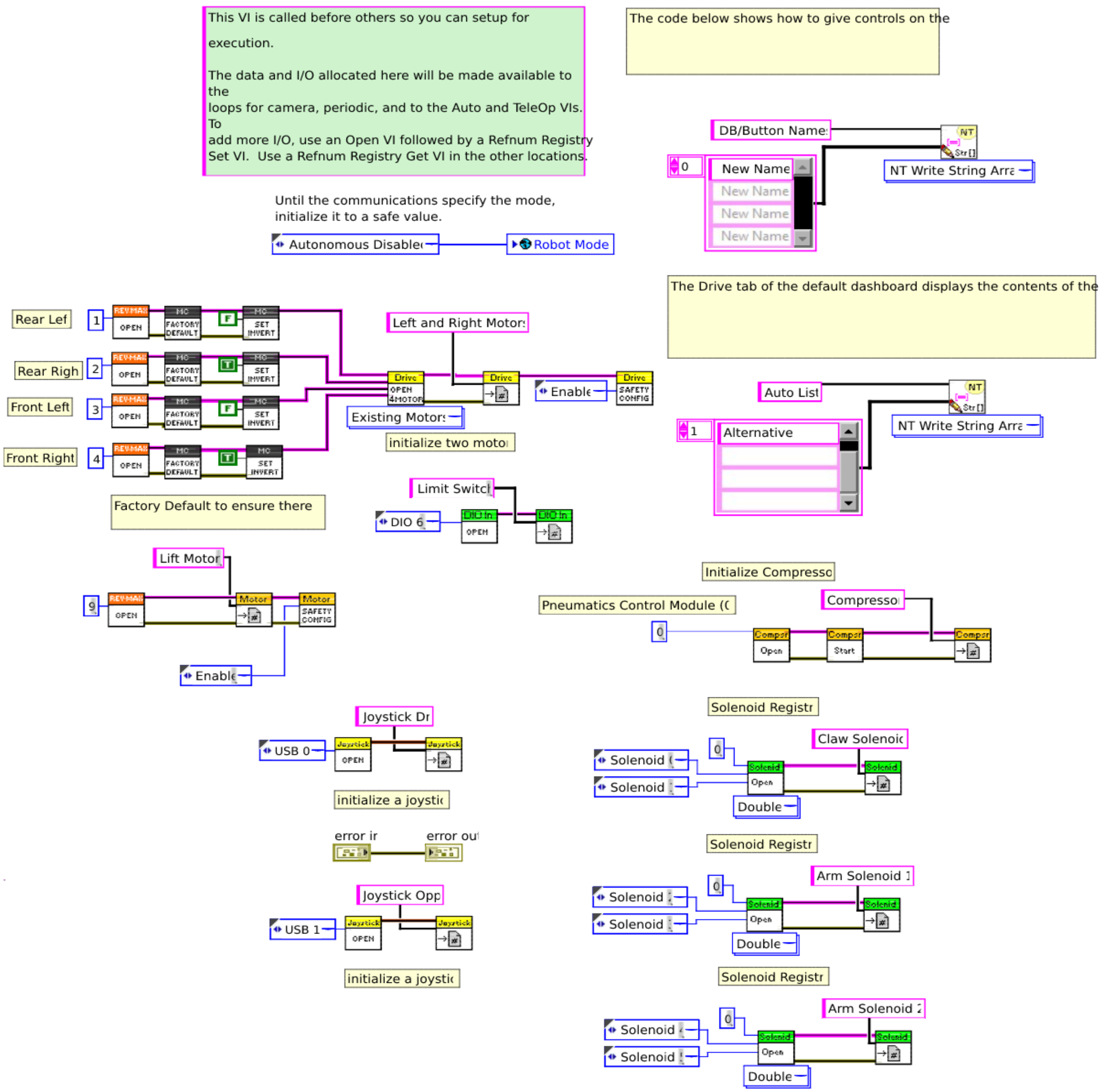
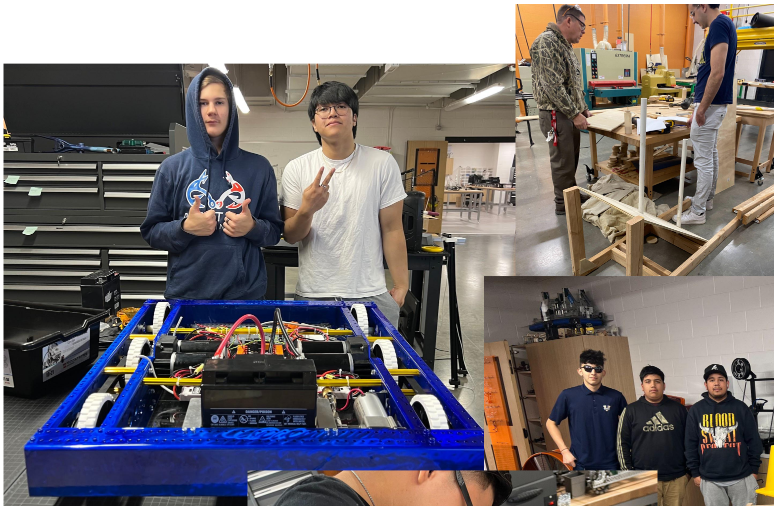
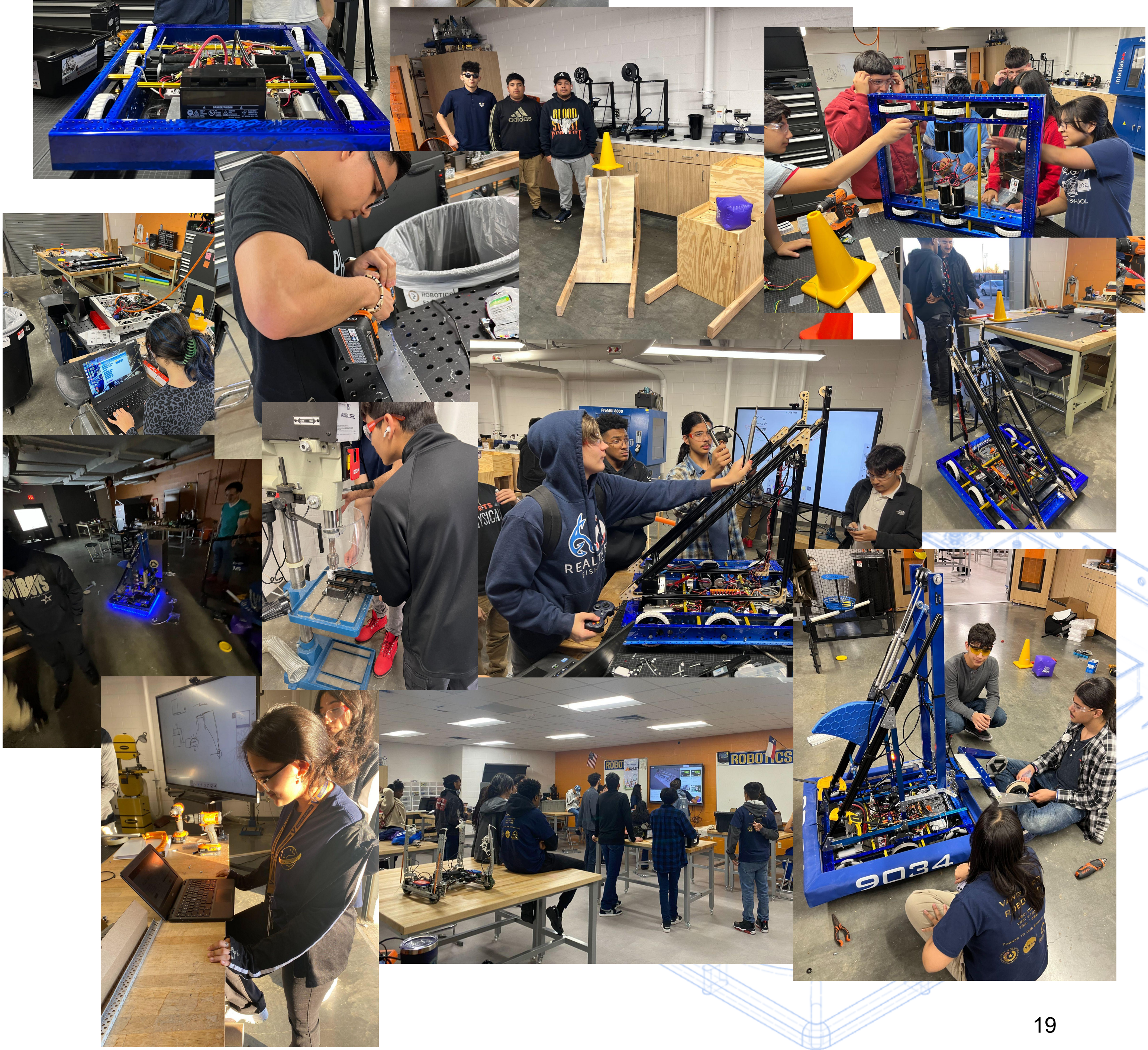


Collaborations & Pictures

We collaborated with other programs at our school to help make our team successful. Automotive collision painted the frame and construction built the field elements for driver practice.





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