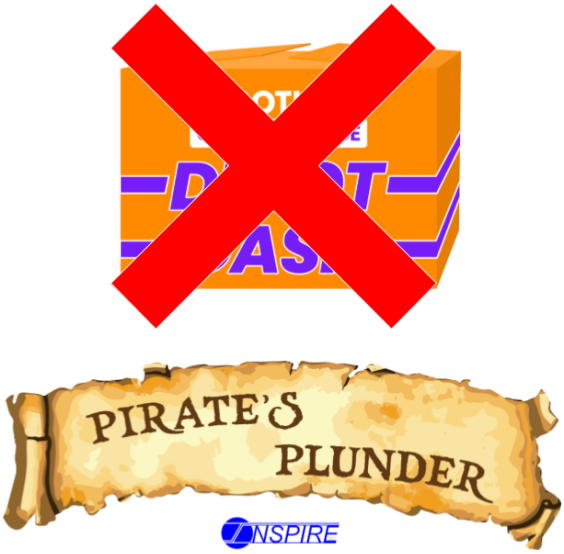


Team 9999 InspireNC Submission

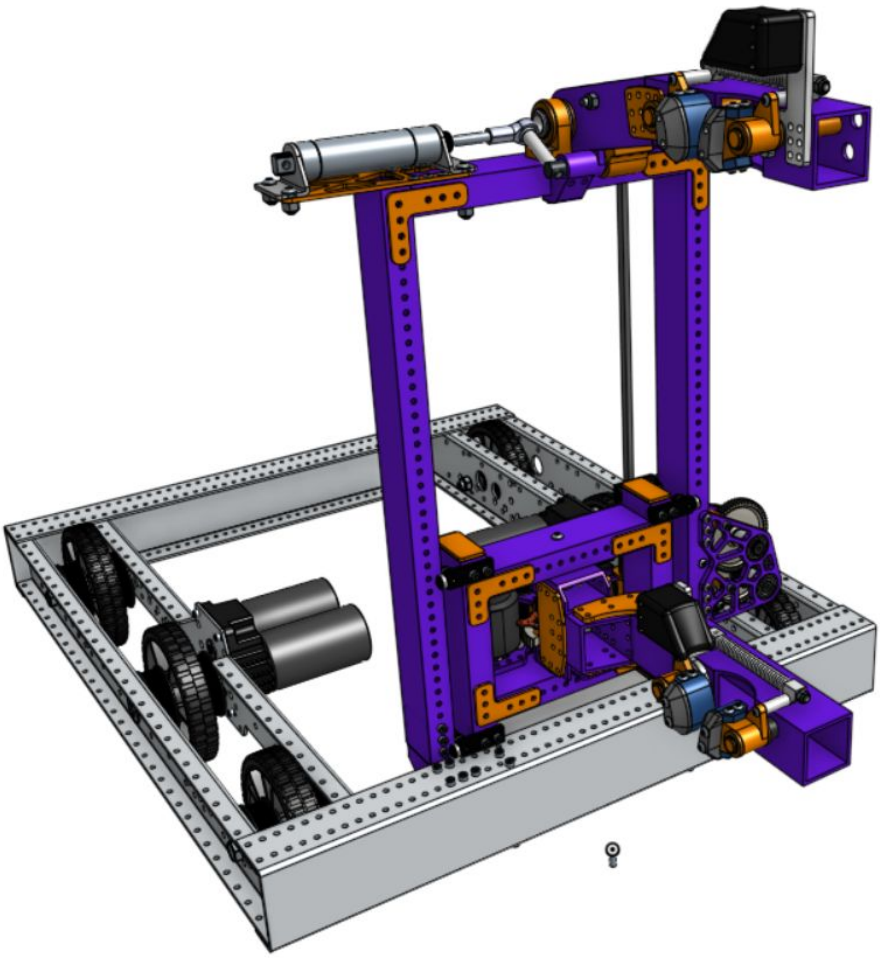
offseason demo team x dirtman

By: BitSentinel and moto moto

Table of Contents

Section 1: Robot

1.1 Robot: OverRun



1.2 Description

For the Fall 2020 ~~Roboticon CAD Challenge Depot Dash~~ InspireNC CAD Mechanism Competition *Pirate's Plunder*, we designed a mechanism that would climb to the 3rd knot quickly and efficiently. Using the criteria given, we built the most effective, the most beautiful, and the most ingenuitive robot possible. Extensive analysis was utilized in order to create a proper and safe environment that would allow us to make the strategic, collaborative, and competitive decisions that would allow us to create the robot that we did. This will all be outlined later within the tech binder. Through being inspirational and empowering young creators, offseason demo team 9999 x dirtman 645 is one of the strongest competitors in the field today. CAD for OverRun can be found here, here, here, here, here, here, here, here, here, or here.

Section 2: Strategy

Table 4-1 Point Values

Award	Awarded For...	AUTO	TELEOP	Qual.
Descend from CLIMBING ROPES	ROBOT begins the match completely suspended by the CLIMBING ROPES and descends to the point where they are fully supported by the PLATFORM underneath the CLIMBING ROPES	5	-	-
TREASURE	Each TREASURE contained in a scored TREASURE CHEST	4	2	-
TREASURE CHEST	Each TREASURE CHEST passed through the VAULT STATION	20	10	-
ENDGAME Points	ELEVATE (per ROBOT)	-	60	-
	PARK (per ROBOT)	-	10	-
GOTTA CATCH 'EM ALL	Collect and SCORE all TREASURE that was present in the ALLIANCE SHIP and STASHES	-	-	1 RP
CLIMB ABOARD	At least 120 points scored during the ENDGAME period	-	-	1 RP
Tie	Completing a MATCH with the same number of points as your OPPONENT	-	-	1 RP
Win	Completing a MATCH with more points than your OPPONENT	-	-	2 RP

OverRun climbs to the third knot because climbing is the best possible points per second task in this game. Additionally, climbing to the third knot is a minimal increase in difficulty from the first or second knot with our climb concept.

2.1 Autonomous

OverRun will start the match on the rope and will autonomously rappel down the rope to the bottom.

2.2 Teleoperated

The robot will attempt to “play dead” in order to scare the referees and observers thinking that a robot has died on the field. Furthermore, it is a long term strategic play due to the statistical phenomena known as the JVN effect. It is as follows: the more time you spend dead on the field the higher the chance is of JVN visiting your pit and writing a blog post about you. This was largely overlooked by other mechanism teams so keep that in mind. This leads into our second statistical phenomena known as the IFI Effect which has a correlation to the JVN effect. As the amount of the JVN spends in your pit goes up the chance that you join #TeamIFI increases. Many teams are only concerned about CAD and basic baseline monkey strategy but offseason demo team 9999 x dirtman 645 takes a completely holistic approach when deciding what to do. This takes our team into a higher plane of existence compared to others.

2.3 Endgame

Will we climb? Yes we will. That’s all there is. We will go to the top knot, pass go, and collect 60 points. We decided to go for the 3rd knot as it awarded the most points, would be equally as

reliable as climbing knot one and knot two (passing each knot will have a certain success rate but they will be generally constant as it is the same mechanism trying to climb the same knots). Being able to climb to the 3rd knot allows for more versatility in elimination rounds so if there is a close match we can take the extra time to get all 60 points. We strongly believe that this is as consistent as a mech that would just latch to knot one as all of our mechanisms are rigid, analyzed, and tested in CAD to be successful. With our well planned layout sketches, even if midway through the season we see that this would not be viable to climb to knot 3, we have ensured that it would be consistent enough to get some hanging points. For versatility, competitiveness, and the overall advantage it provides, we decided on the 3rd knot mechanism that we did.

2.4 Extensive Analysis

Unlike other teams that are competing, we used extensive analysis in order to make a decision. We held a 2 hour discord call before we even opened OnShape to discuss and the one member who is in college made realistic prototypes in the shop near them. We also used a weighted decision matrix in order to mathematically generate the best mechanism.

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Winning Design
Poggers Design: 230

Criteria	Weight
Simplicity	7
Stability	10
Programming	2
Control	4
Cost	5
Adaptability	6
Speed	9
Scoring	0

Design Name	Score
Nor Poggers Design	111

Criteria	Score	Weighted
Simplicity	1	7
Stability	1	10
Programming	1	2
Control	2	8
Cost	3	15
Adaptability	4	24
Speed	5	45
Scoring	5	0

Design Name	Score
Poggers Design	230

Criteria	Score	Weighted
Simplicity	4	28
Stability	2	20
Programming	7	14
Control	6	24
Cost	3	15
Adaptability	8	48
Speed	9	81
Scoring	2	0

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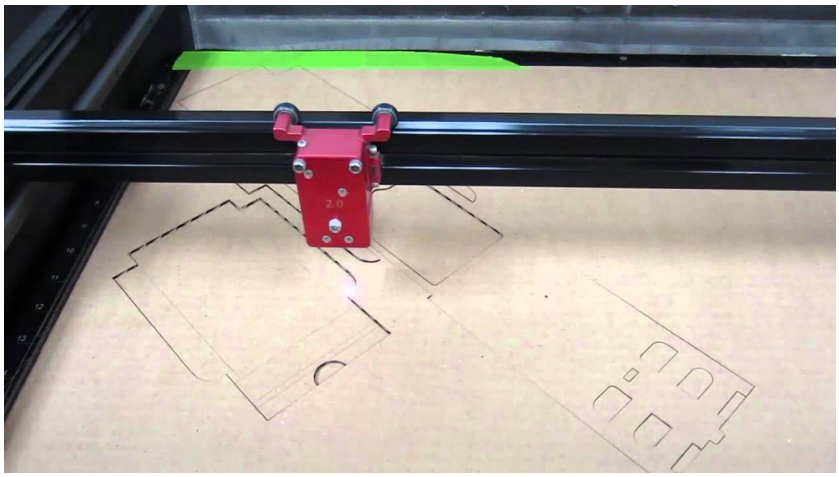
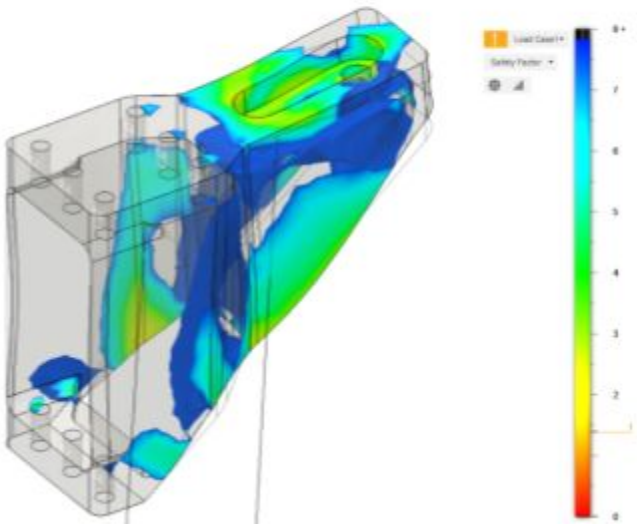


hardcore fea performed using NASA computers



Section 3: Climber

3.1 Render

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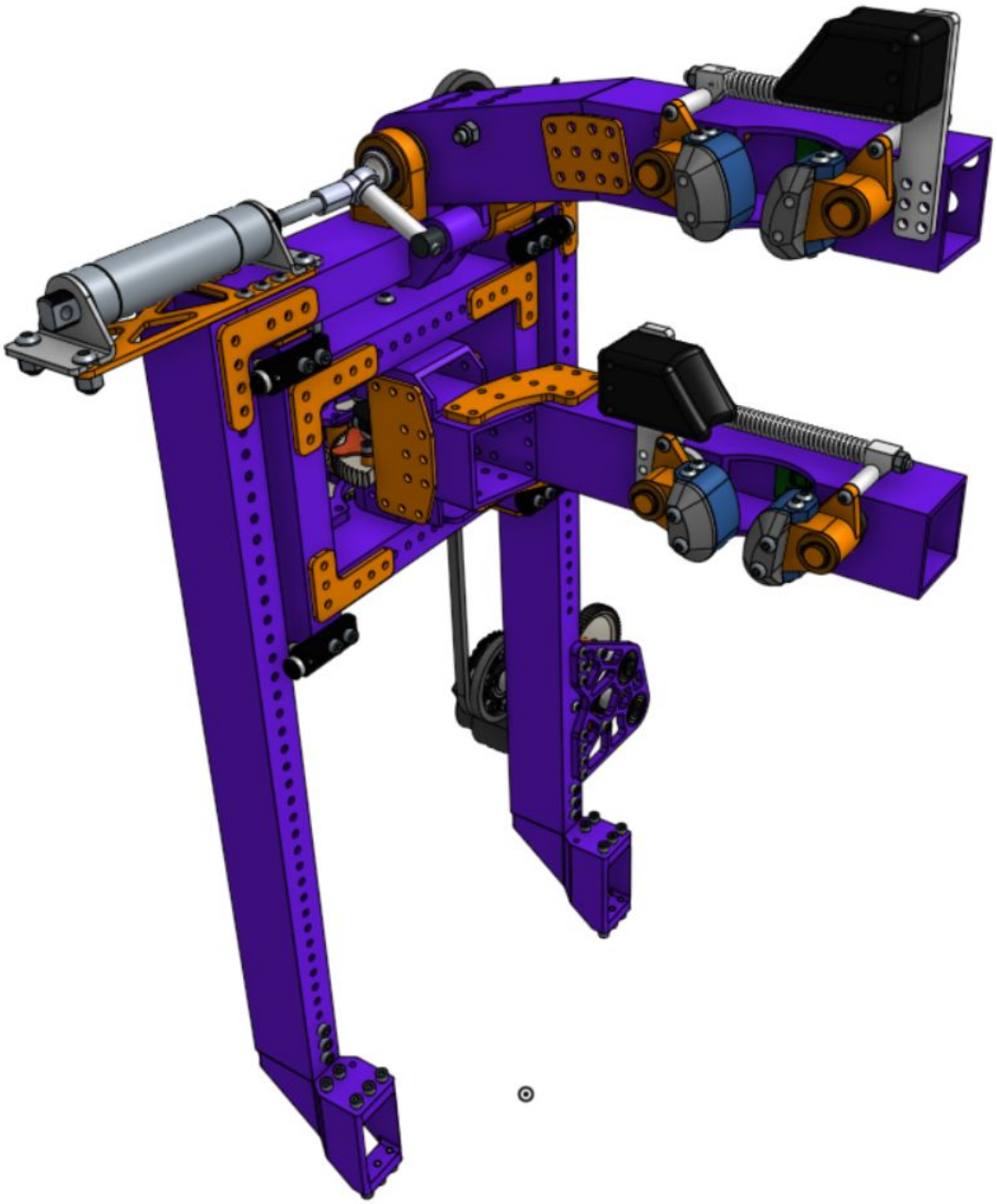


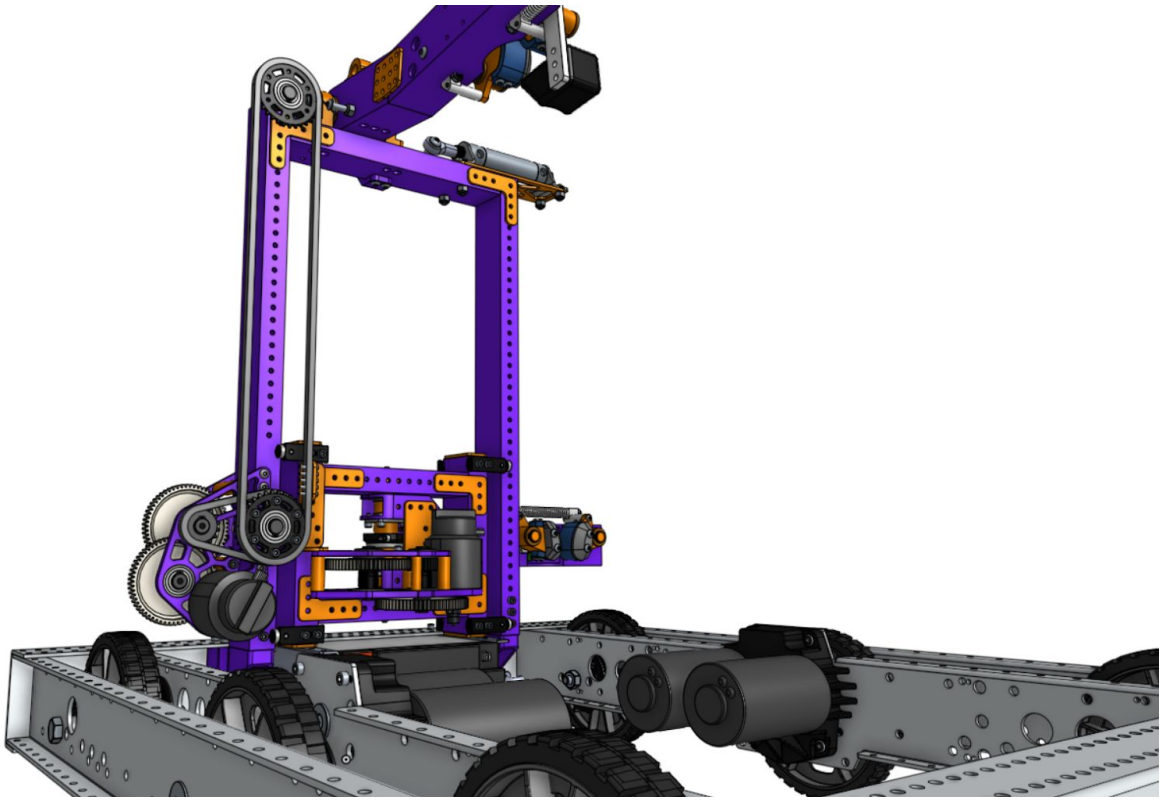
3.2 Description

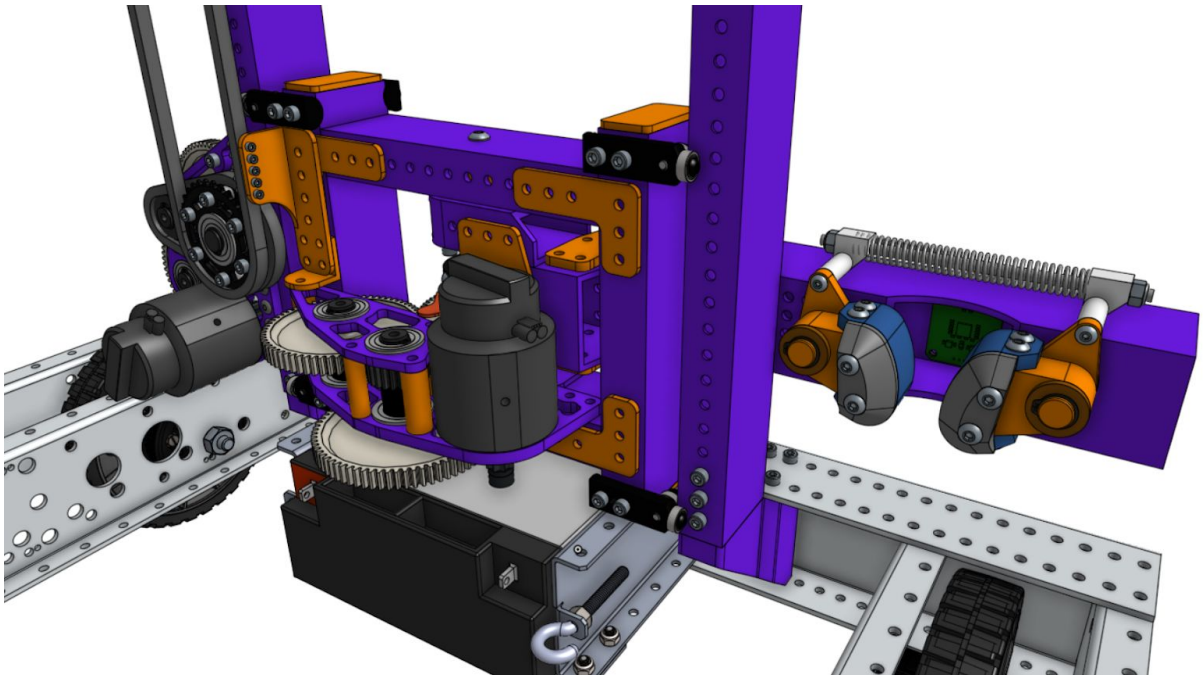
In order to climb, the robot will first extend the arms and use a driver assist camera and physical alignment features to align the rope properly into the cams. The cams then engage to provide pressure on the rope, and the elevator shuttles the lower pair of cams up and down until a climb is achieved. When the bottom cam pair is traveling up, the top cam pair is engaged, while the rope slips through the bottom cam set. When the carriage moves down, the cams wedge together against the rope, and climb. The top cam set prevents the robot from falling when the carriage is moving up, and after the match ends. The outer parts of the cams have 1 inch blue nitrile treads to increase friction with the rope. The main alignment features are the black plastic ramps, which take advantage of the moment created by the robots weight hanging on the rope to force the rope to stay properly aligned in the cams.

The sensors included are a LaserShark (LiDAR Ranging) sensor from Copperforge, which is used to detect the rope to aid in alignment, and a lamprey encoder in order to detect the rotation of the arm. When extended the arm gearbox is backdrivable, minimizing the possibility of stripped gears or broken parts. In terms of strategy, it was decided that this was the most reliable way of climbing as a: an elevator is a tried and tested mechanism in FRC, using the pneumatically actuated cams provides a strong and secure attachment to the rope, and it would have no issues passing the knots. Furthermore, it is easy to make it autonomous

so we can climb quickly to the top of the rope. As seen in the extensive analysis section, we have completed FEA on this part so we know that it will last for many matches. It uses two falcons (the only motor you will ever need) and pneumatic pistons in order to perform various actuations.

3.4 Additional Images





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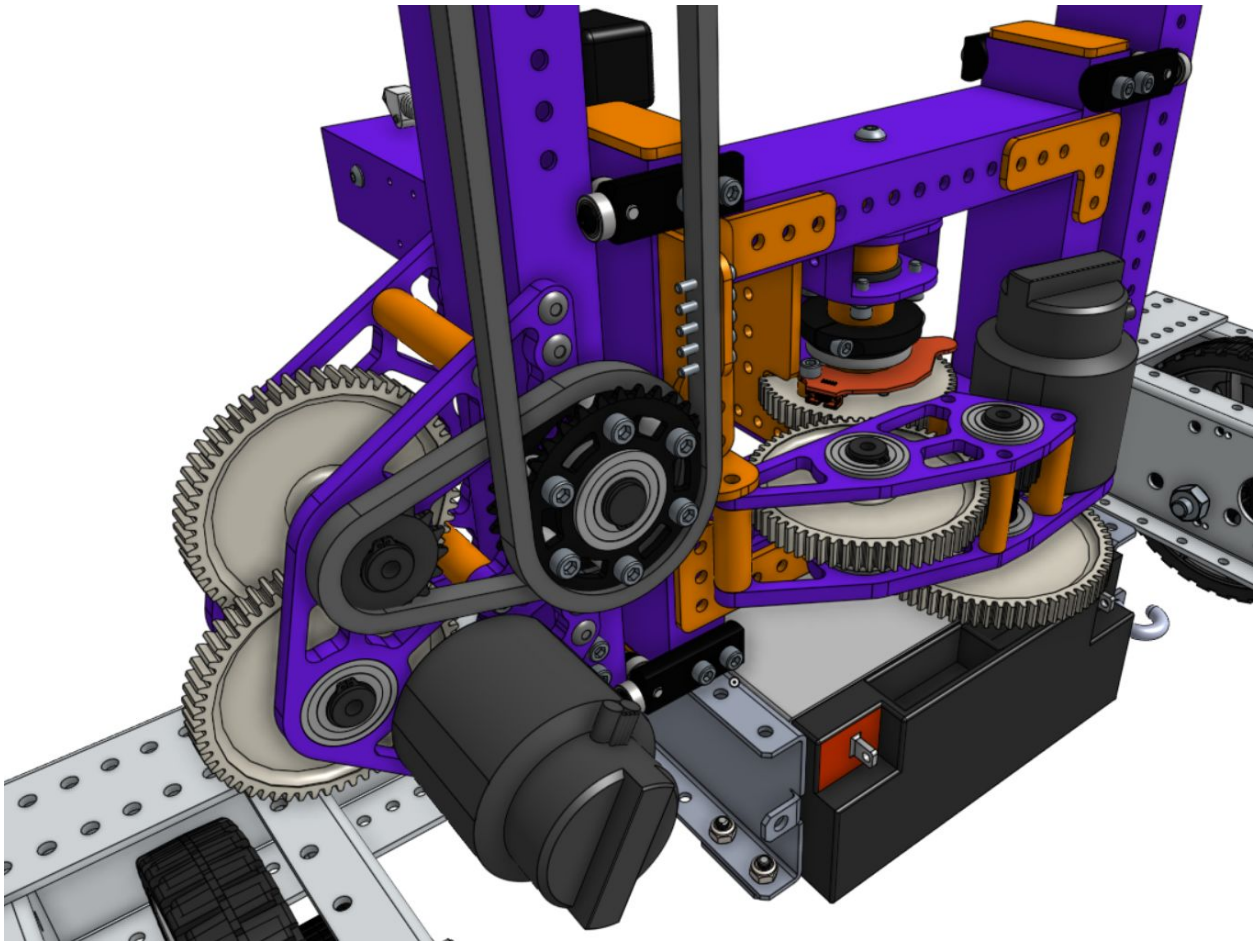

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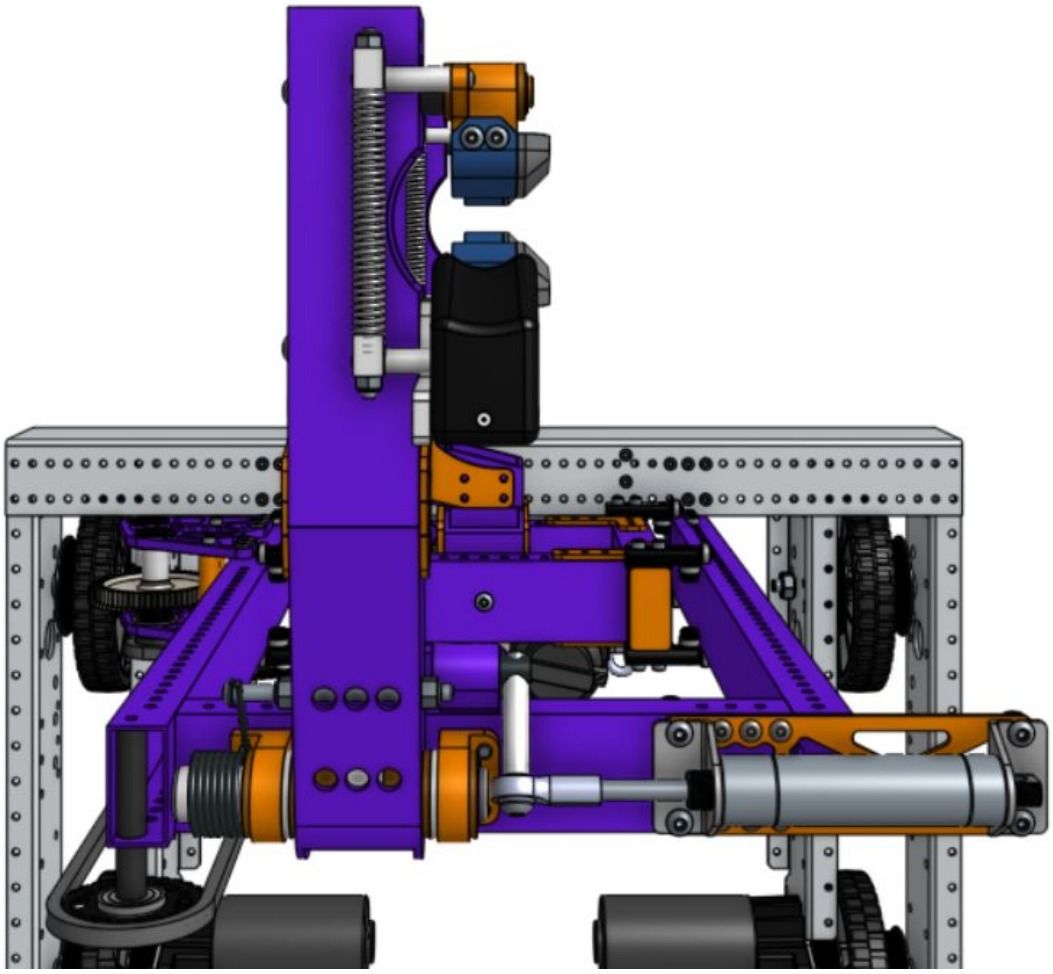

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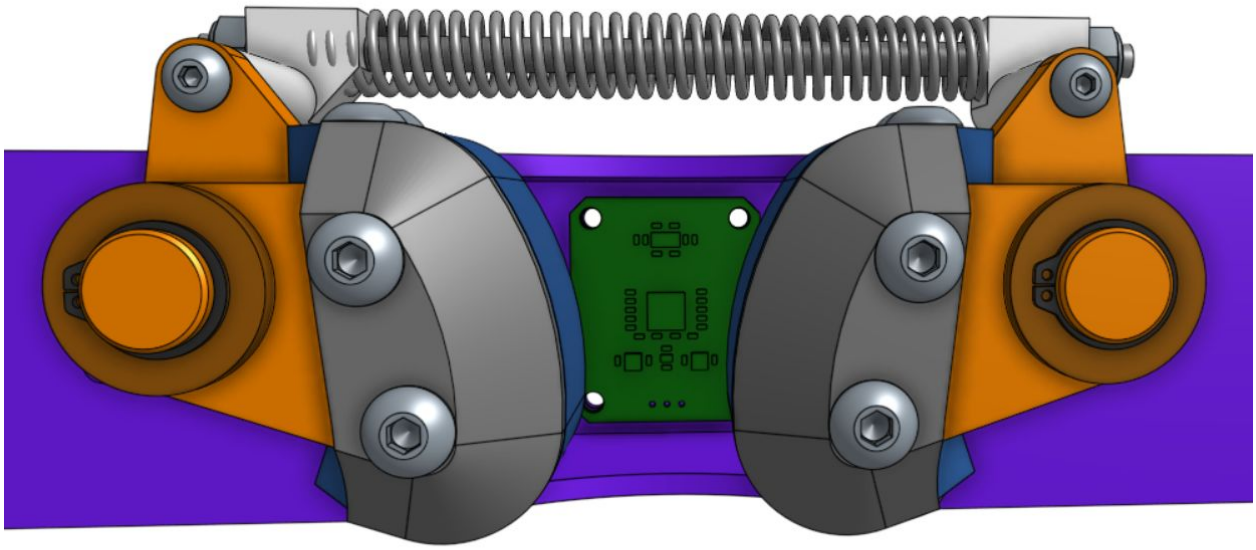

Section 4: Manufacturing

4.1 Machines

Large VMC

Morally Questionable Chinese Router

offseason demo team 9999 x dirtman 645

Amazon Basics Bandsaw

This Thing Probably idk

4.2 Description

To make our robot, we use common hand tools that every team has or at least should have. The parts are relatively simple as though a freshman could go from stock to part very quickly. It also makes use of a small number of parts that need a full cnc mill and several setups, to add some flavor. If you're poor these could be outsourced. If you can't afford that, build an everybot.