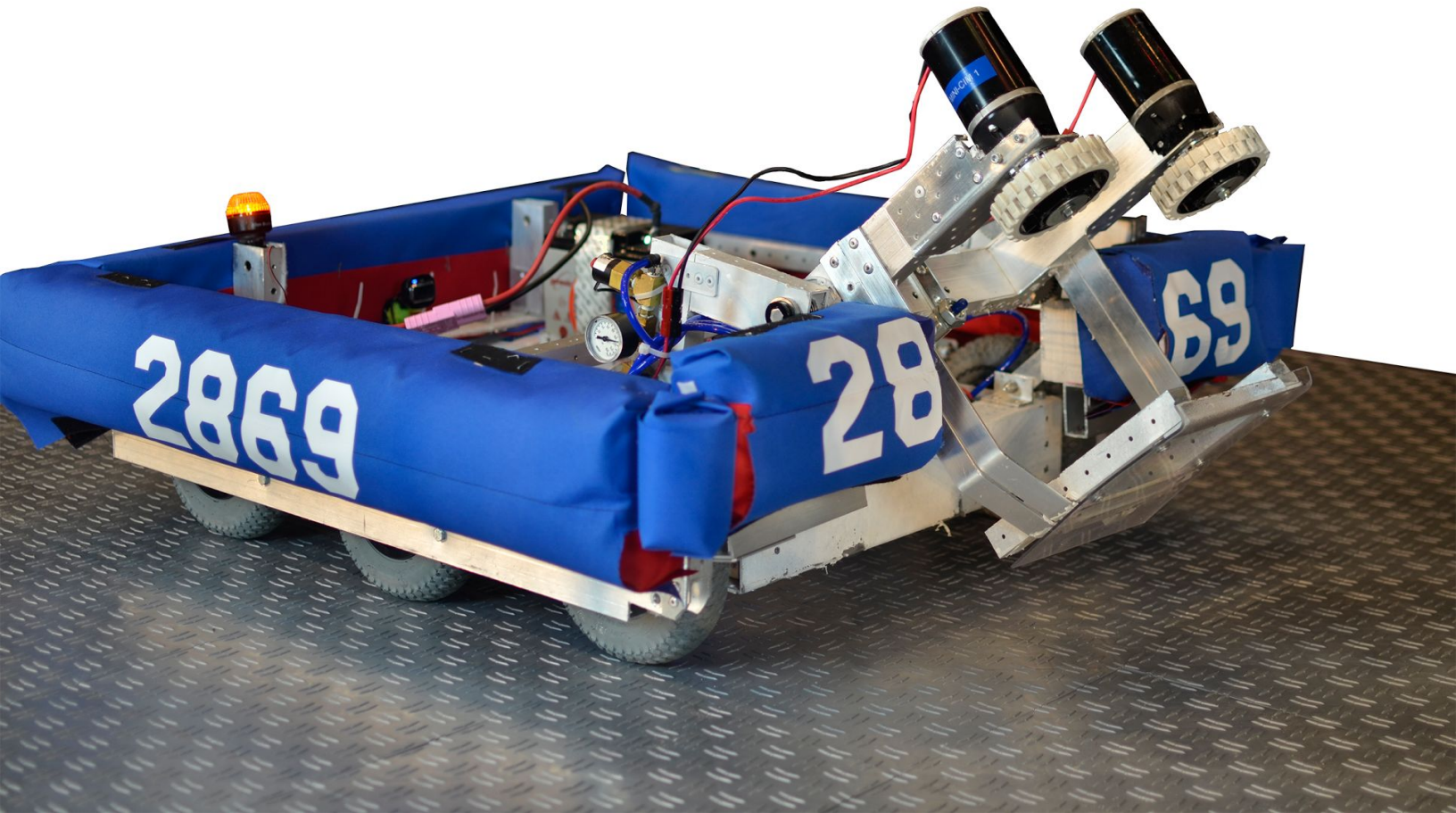
Regal Eagles

2869

2016

Engineering Notebook



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Game Analysis

The Quest

- Robots operate independently for first 15 seconds of the Quest
  - Alliances score points by:
- Reaching opponents defenses
- Crossing defenses
- Scoring boulders through goals in the opposing tower
- Human drivers take control for the final 2 minutes and 15 seconds controlling their robot to:
  - Defend their castle
  - Retrieve boulders
  - Defeat defenses
  - Score goals from the opponents' courtyard in tower
  - Capture and scale the opponent's tower

The Outer Works (outermost line of fortification)

- Eight defensive options (over 18,000 possible field configurations)
  - One permanent (the low bar)
  - One chosen periodically by the audience
  - Three selected by Alliances just before each Quest begins
- Once the Quest begins
  - Illuminated lights on each defense reduce when an opposing robot fully crosses it for first time
  - These lights go dark after the defense has been crossed a second time, signaling it's considered damaged
  - Once any four of the five defenses are damaged, the fortifications are considered breached and the charging Alliance is rewarded with points

The Tower

- Openings in the tower are available for robots to score boulders
- During last 20 seconds of the Quest, robots may surround and scale the tower to capture it

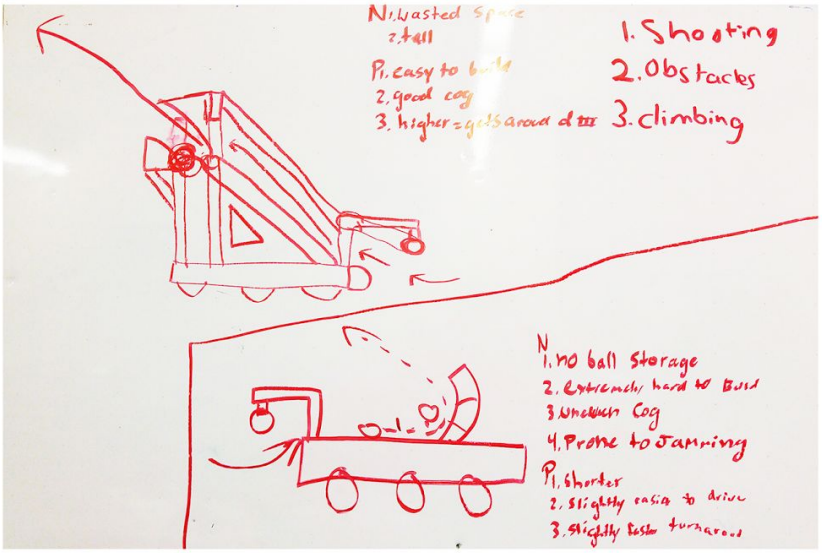
Game Analysis

Action	AUTO	TELEOP		Qual.	Playoff
REACHING a DEFENSE	2	-		-	-
CROSSING an UNDAMAGED DEFENSE	10	5		-	-
BOULDER in Low TOWER GOAL	5	2		-	-
BOULDER in High TOWER GOAL	10	5		-	-
CHALLENGE (per ROBOT)	-	5		-	-
SCALE (per ROBOT)	-	15		-	-
BREACH	-	-		1 RP	20
CAPTURE	-	-		1 RP	25

Priorities

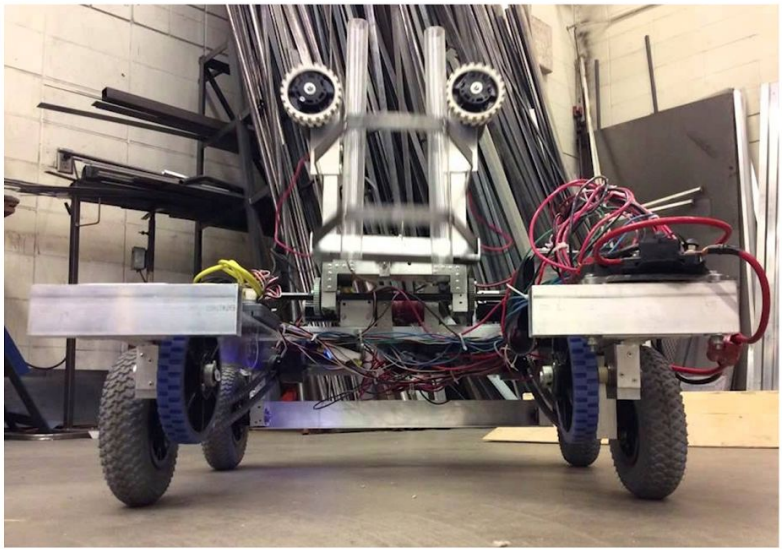
1. Score low goals and high goals
2. Cross every defense
3. Cross a defense in autonomous
4. Capture tower
5. Scale
6. Fit under Low Bar

Prototypes/ Inspiration



Day 1 - Design
Originally we decided that we wanted to make a robot that only scored high goals, and these were the two designs that we came up with.

RI3D - Greenhorns
After looking at all of the RI3D robots, we knew Rivvet was similiar to what we wanted. So we spoke a lot to one of the members of the team in order to create something similar but with more optimization.



Prototypes/ Inspiration

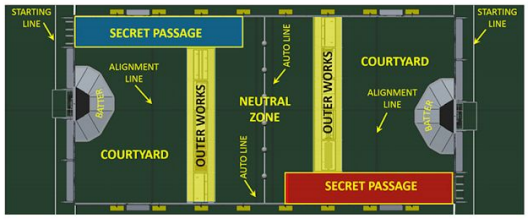
FRC Team 997 - 2013 Climber

The last bit of inspiration for our design came from team 997. After doing quite a bit of research on climbers from the 2013 game (Ultimate Ascent) and the 2010 game (Breakaway) we found the easiest and most robust climber is a pneumatic cylinder. We have a few large format Bimba cylinders laying around so we imediately tested it out by hanging weights off it. To our delight it worked the first time and we worked on making a mount for it.

Final Design

Design Strategy

The first thing we did when we needed to figure out our final design was to come up with an effective strategy. We saw that breaching was a must, so we set up a dual cim pneumatic wheel drive. We also saw that high goals were worth more, but fast low goals could defeat the tower quicker. Because of that we decided to make a robot that could effectively shoot high goals and low goals.



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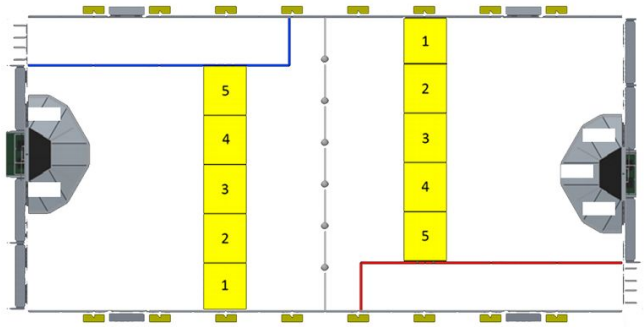


FRC Team 2869 - The Regal Eagles - 2016

Match Strategy

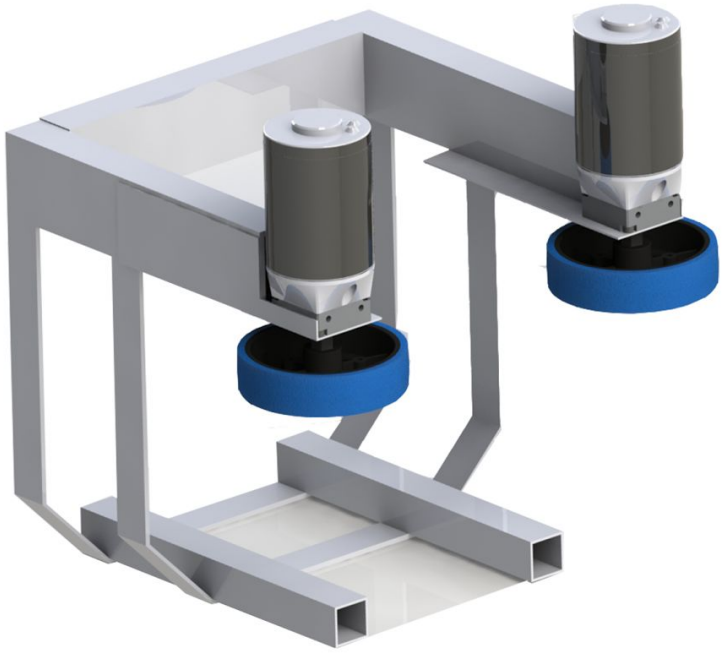
After we had an overall design strategy we worked on our match strategy. To start during autonomous we will go over a few defenses. These defenses include "The Rock Wall", "The Rough Terrain", or "The Ramparts." We can go over the moat, but we prefer not to. So right out of the gates we have 10pts. As soon as we start teleop (Driver Controlled period) , we dump our preloaded boulder into the low goal for a quick 2pts. We then cross either the "Sally Port" or "Drawbridge" in order to hold it open for our teammates to cross. We then cut to the midline and intake a boulder. Throughout the next 1:45 we cycle going over a defense and dumping low goals. In the last 30 seconds of the match we will challenge the tower. Once we get on the tower we will either turn 90 degrees or deploy our climber.

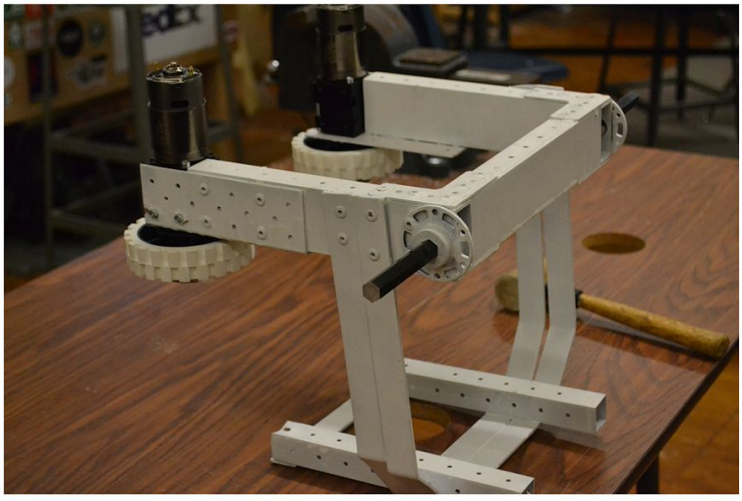
Final Design

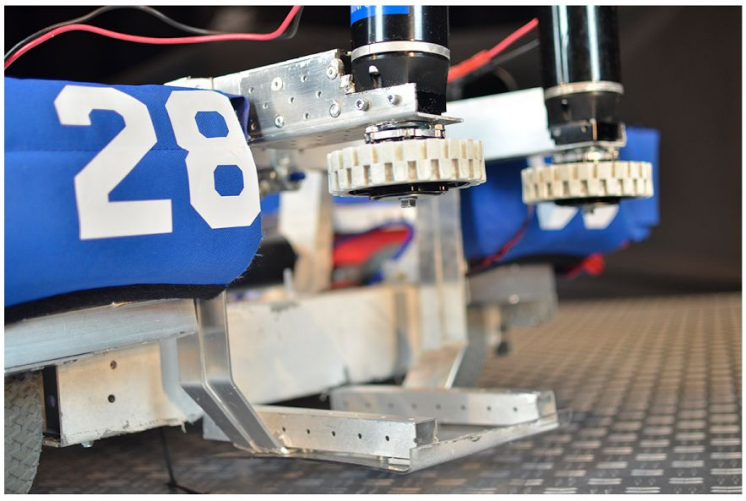
De Klauw

The claw

De Klauw is pretty much the most important part of our robot. It intakes boulder, and then shoots boulders into either the high goal or the low goal. We spent a lot of time tweaking De Klauw to make sure the compression was right. Whether this was changing the spacing of the wheels, the wheels themselves, or the length of the back bar. We finally settled on 1.5" of compression. We also had some motor issues. As you can see in the picture below we are using 775pro motors with a 3:1 Versaplanetary but on the pictures to the right we are using Mini-Cims with a versaplanetary acting as a shaft adaptor. Overall we found the Mini-Cims to be more reliable and robust.





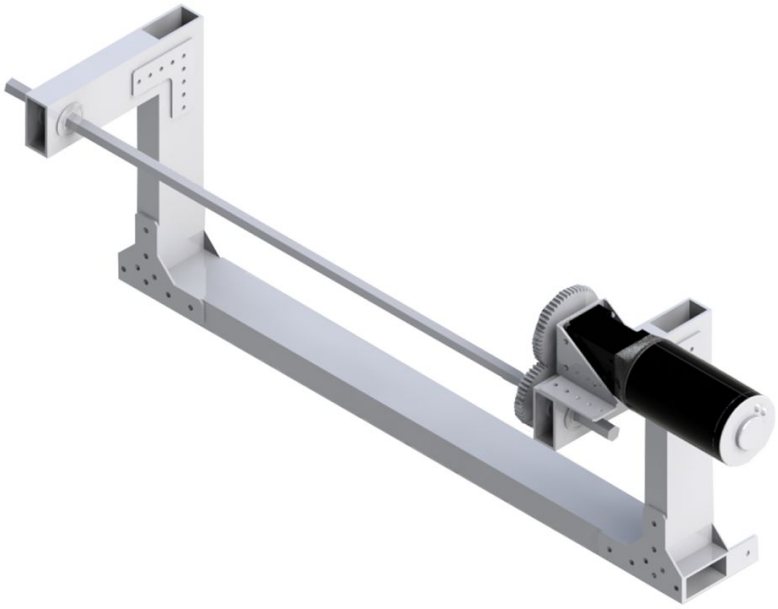


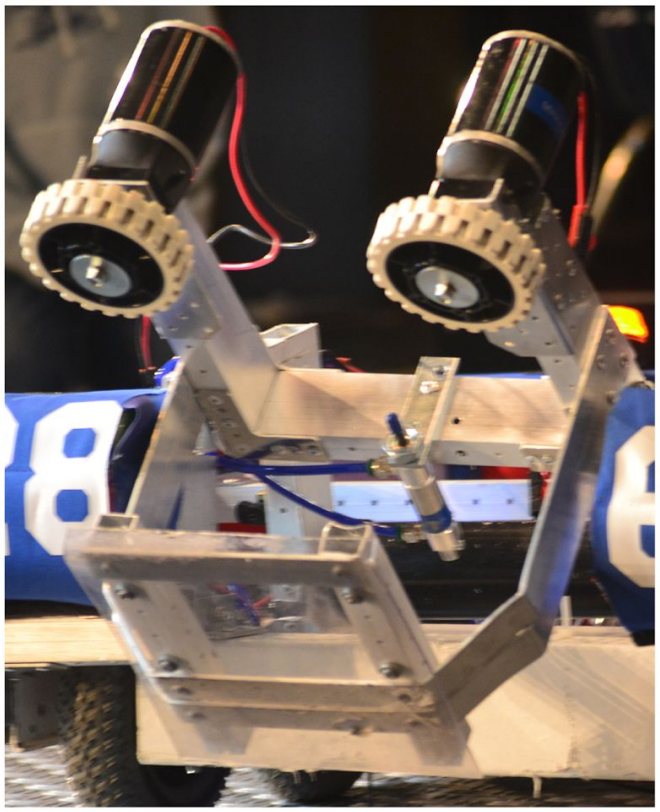
Final Design

De Arm

The Arm

De Arm is also a vital part of our robot. To start, it is manufactured mostly out of 2x1 Versaframe tubing. From there We attached a 48t gear to a hex shaft which rotates De Klauw. Then we added a 100:1 Versaplanetary with a 48t gear direct output allowing us to have plenty of tourqe to rotate De Klauw. The biggest feature of De Arm is that it can be pivoted back, allowing us to be in our Starting Configuration.





De Indexer

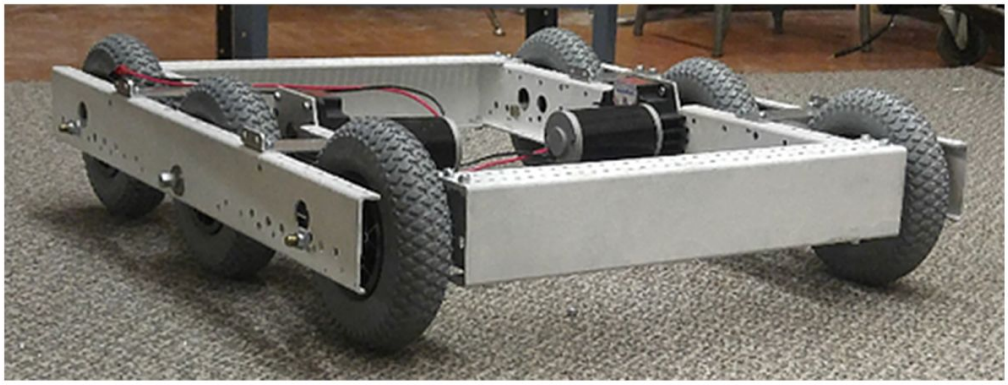
The Indexer

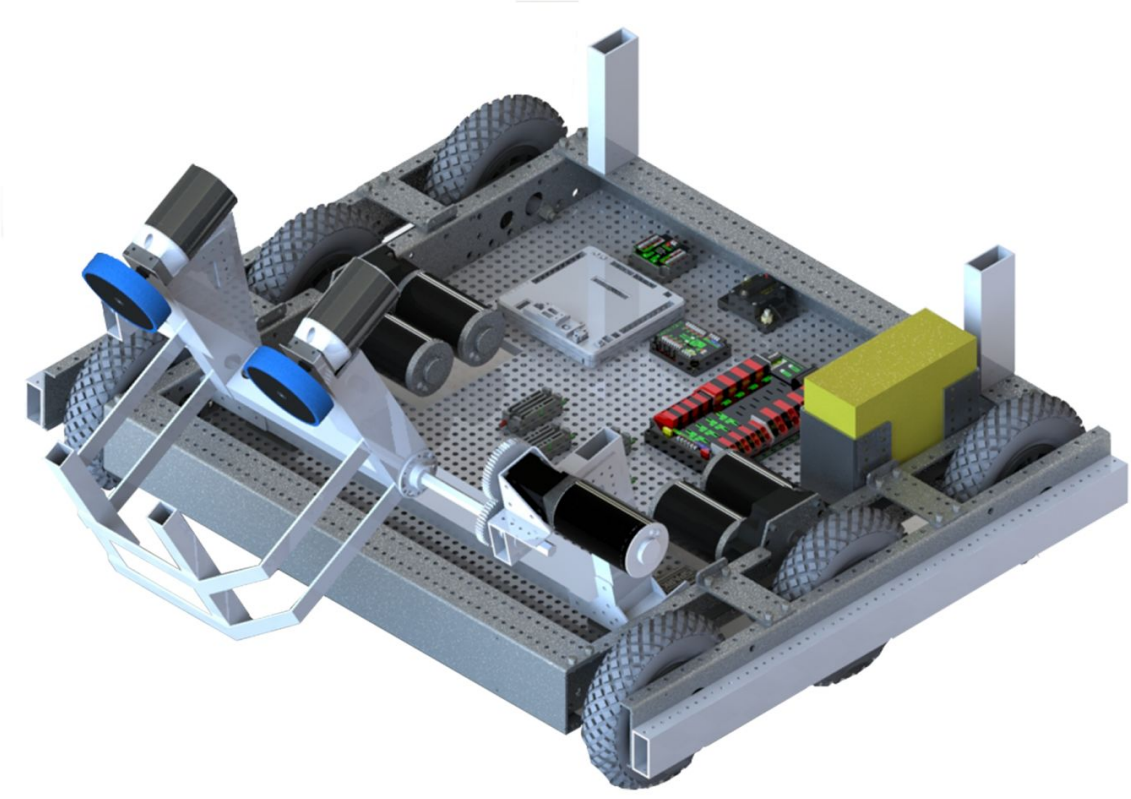
De Indexer was a part that we had quite a few issues with. We wanted to use a cylinder from the start but had issues mounting one. We tried to use a servo, but the loads were too big ...and we broke 3. After a lot of trial and error, we built a very robust indexer solution which includes a 4.25" long cylinder with a 1/2" stroke. It provides just enough of a push to move the boulder into the wheels for a shot.

Final Design

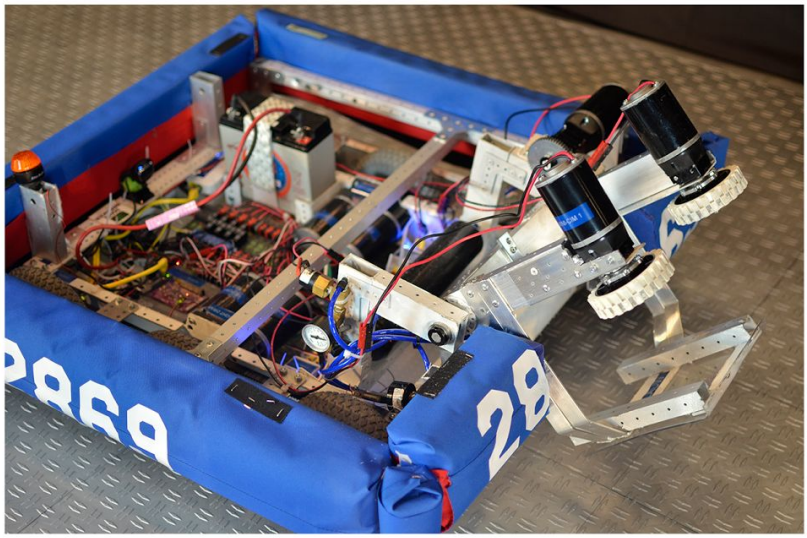
Drive Train

Our dtive train choice was pretty simple. Essentially we just use a modified Am14u3 with 8" pnematic wheels. We are also now using Dual Cims unlike the picture below.





Design Upgrades



Reinforcements

After competing at the Suffield Shakedown and going through 14 matches, we realized we should add some extra bracing. We started by adding a small 1x1 cage on each size. This cage helped to better support the bumpers. We then added a 1x1 cross brace that considerably increased rigidity.

Climber

Our climber is simple, yet effective. We then started with a single 36" Bimba cylinder. From there we added a small hook made out of an Am14u2 side. Then we added an articulation mechanism with 56t gears and a 100:1 Versaplanetary with a Cim. The cylinder is attached to a 1/2" hex shaft with a custom mount waterjet cut out of 7075 t6 aluminum.

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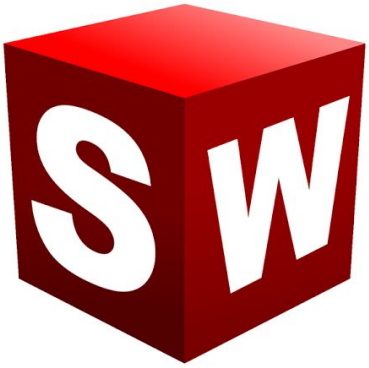
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