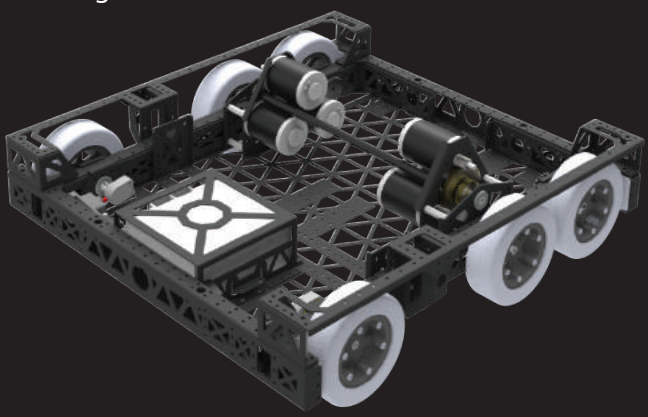
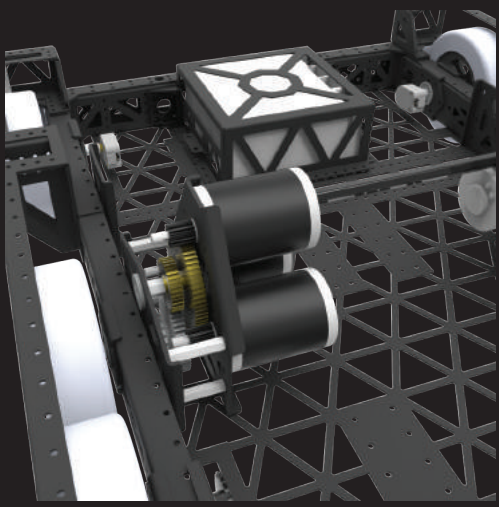
DRIVETRAIN

Our robot utilizes a single speed, configurable drivetrain. It has a top speed of 18 ft per second, and is intended to be as light as possible. This allows for fast and agile cube scoring.



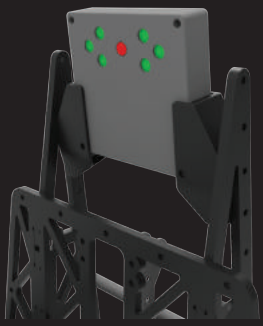
The robot was intentionally designed to be a few inches inside of each of the maximum dimensions. This small footprint allows for more maneuverability on the field, and its short stature allows us to drive underneath the scale, regardless of which way it is tipped.



The robot's modular construction system allows us to iterate quickly and efficiently throughout the entire season. Subsystems are integrated together such that each can be quickly removed and replaced, thereby making each of them easily upgradeable.

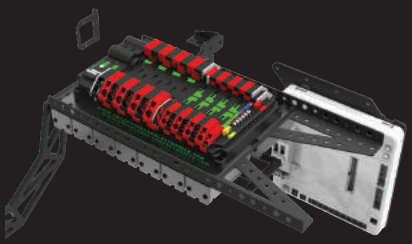
PROGRAMMING

This season, we developed a variety of custom programming tools to aid in autonomous, and make our driver's jobs easier. Turning and trajectory code allows the robot to correct for position and velocity hundreds of times per second.



Our elevator has multiple pre-set positions to allow for repeatable scoring actions by the robot throughout a match. We've also developed an "Auto-Score" feature that allows the robot to reliably place a cube and back away, all on its own.

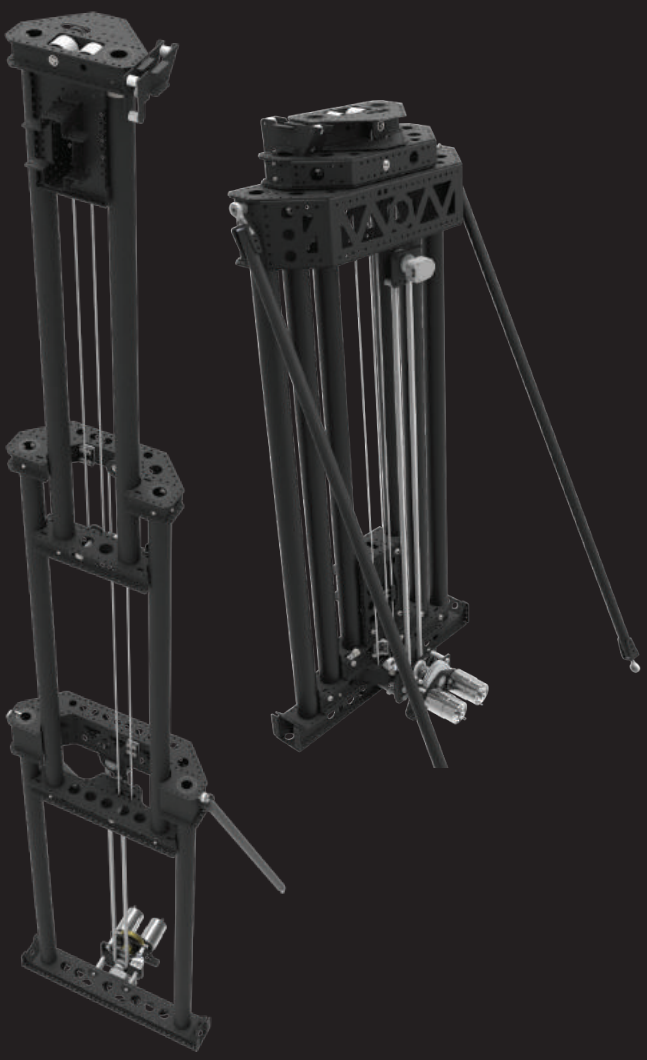
ELECTRICAL



- Talon SRX Breakout to allow for simple encoder integration.
- Compact, two sided electronics panel allows the entire control system and electrical package to maintain a minimal footprint ,while also keeping a low robot center of gravity.

ELEVATOR

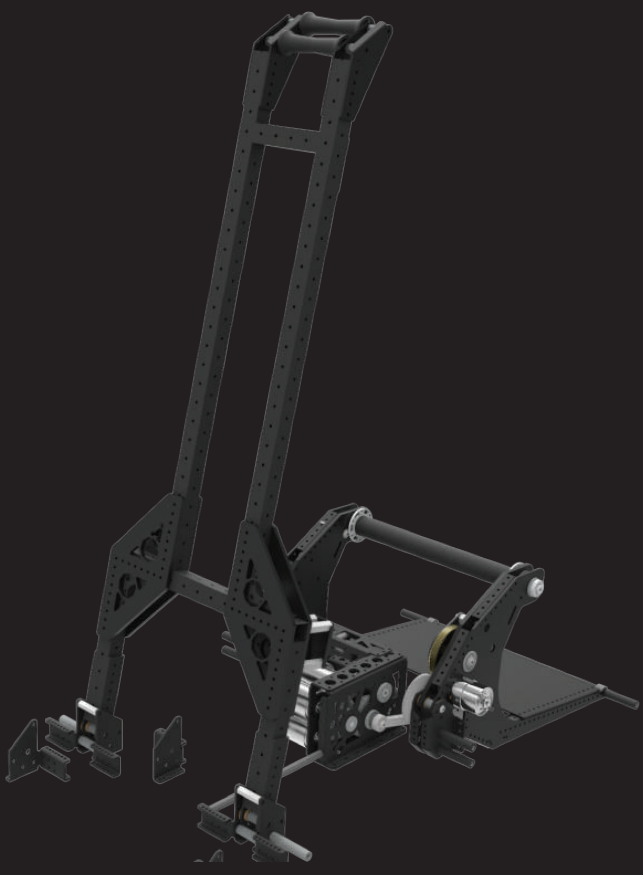
Our cascading-style elevator is driven by two 775pro motors. It can lift a cube from the ground, up to a max height of 90" in under half a second,! When fully collapsed, the elevator is at a height of under 42" to allow driving under the scale. The bottom stage of the elevator is driven through chain, while the top two stages are driven by tensioned dyneema cable. This cable is 8 times lighter than steel wire, yet 15 times stronger.



The elevator also utilizes 3D printed rollers, and a lightweight, thin-wall tubing construction to minimize weight. The elevator also uses constant force springs to reduce the active lifting weight.

CLIMBER

The climber uses three 775pro motors, and a 4-stage reduction gearbox. The robot parallel parks alongside the hanging bar and attaches itself through a deployable hook that is VELCRO mounted onto the top of the elevator. After dropping the elevator, the hook remains attached to the bar, and is winched in.



Even though our robot is less than maximum weight, it can easily accommodate "bigger" partners. The robot can lift itself, and one full-weight partner in under 3 seconds.
An “A-Frame” is mounted into the middle of the robot to ease the hanging process. This frame directs force such that both robots remain balanced as they are lifted.

ROBOT WRANGLER

Look, you've probably seen a variant of each of our other subsystems on another robot at this competition. But trust us, *nobody* else will have a Robot Wrangler. This deployable roller actively grabs a partnered robot, and holds them snugly in a locked position so that they do not change positions while climbing.

Our partner first deploys a pre-attached VELCRO rope, which we grab with a one-way ratcheting roller. After attaching, the partner robot is pulled onto a set of forks that supports its underside while climbing. These forks are capable of supporting a robot at the maximum allowed weight.

INTAKE

Our “Touch It, Own It” intake is designed to pick up a cube regardless of its orientation. During the process of intaking a cube, the robot flips cubes over a “boot” into a desired orientation. This allows us to maximize the number of cubes that will fit into the scale or switch.

The intake is designed and constructed completely out of Lexan. This allows for a lightweight, yet rigid design, and minimizes the weight that needs to be lifted by the elevator. The intake also contains a passive “drinking bird” mechanism that holds a cube in place during autonomous before the intake unfolds itself.

Design Process

“Design is an iterative process.” Every Robowrangler has heard these words countless times, and it has become a mantra on Team 148. We celebrate failures as opportunities for learning. Our "fail quickly" mentality enables us to create multiple prototypes of each system which were slowly refined into the robot you see today. We want to fail quickly and often to find the most effective way to play this year’s FRC game, Power Up.

We decided to spend a large majority of this season completely dedicated to prototyping and fast iteration. By doing this, we were able to avoid 'painting ourselves into a corner' with some aspect of the robot." We did not assemble a single part of our competition robot until the beginning of week 4.

“There are no failures, only lessons. Fail, Learn, Improve.”

Our designs typically start as crude prototypes and only use materials that we have laying around our shop. In the past, this has consisted of spare metal, wood, and even empty pizza boxes.

We are able to iterate quickly due to the support of our largest sponsor Innovation First, who gives us access to their tools. To build Uppercut we were able to use their 3D-printers, a CNC Router, and full-scale metal fabrication shop.

Early Process
"Diverge"

Late Process
"Converge"

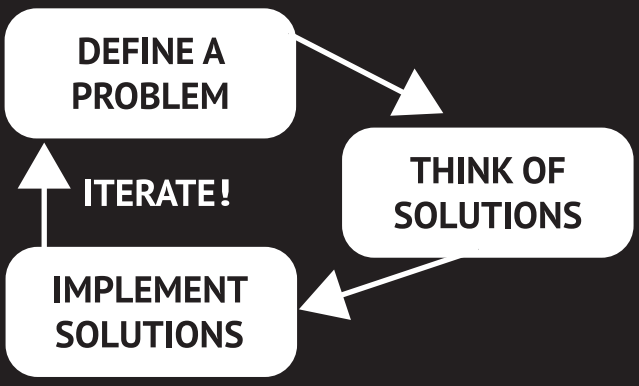
CREATE CHOICES

MAKE DECISIONS

After compiling all the lessons we learned through the first part of build season, we move towards a desired goal, while also weighing the potential trade-offs that will have to be made in order to achieve it. One particular example this year revolved around our intake.

We decided very early on in the season that it was important to control the orientation in which Power Cubes are scored. We then designed our intake in such a way that it can pickup cubes in any orientation, and so that it always flips them into the taller, narrow configuration.

While we were pleased with our early intake prototypes, we're always looking for ways to make them even better. We actually developed six revisions of the intake before bagging the robot. This process will continue throughout the competition season as we see how FIRST Power Up is actually played, and learn more about the game.



Ask us what intake revision we're on now!

OUTREACH

We've rallied our local community around us, creating strong partnerships with our sponsors and school district. Our local demos inspire the students of Greenville to explore their interest in science and technology in the robotics curriculum within our district, while our global travels enable us to take FIRST's mission further.

We have been an FRC Ambassador team in China for two full seasons, traveling halfway across the globe to mentor FRC teams in China and show them how to build competitive robots and run FRC events. Because of these efforts there are now 2 official Chinese regionals and 85 new FRC teams in China.

Members of our team attended the National Advocacy Conference (NAC) where they learned about the importance of STEM education and discovered the impact it could have at a state level. This served as the inspiration for the STEM Advocacy Conference of Texas (SACOT) which we helped create. Its mission is to give students a voice to advocate for increased government support for STEM-aligned educational activities. Last January, team members participated in the first SACOT Annual Conference where we met with our state representatives and advocated for multiple house bills.

SPONSORS

Greenville ISD

When they started the Robowrangler robotics program, Greenville ISD cemented its position as pioneers of the hands-on, project based learning so common today. Now the district has groundbreaking STEM programs available for students of all age levels, and has over 500 students involved in robotics feeding the Robowrangler High School team.

Innovation First International

Some companies start robotics teams, the Robowranglers started a company. Innovation First International (IFI) was founded by two young engineers Tony Norman and Bob Mimlitch who met while mentoring the Robowranglers. From the company's beginning in 1999, they made sure IFI would always support the team, and since 2007 IFI has been the title sponsor of the Robowranglers.

L3 Aerospace Systems

L-3 has supported the team since its inception. As the founding sponsor of the Robowranglers, their continuing, long-term support of the team is a testament to their commitment to STEM and the students of Greenville. The mentors from L-3, some of whom have been mentoring this program for almost three decades, remain the cornerstone on which the Robowranglers are built!

Chicken Express
Panera Bread
Jimmy John's Gourmet Sandwiches
Texas Workforce Commission
slack
Abbott
The Shop
Rack Solutions
Thrivent Financial

ROBOWRANGLERS

EST. 1992

2 WORLD CHAMPIONSHIP TITLES

SIXTEEN REGIONAL WINS

32 TECHNICAL AWARDS

FOUR DIVISION WINS

2 REGIONAL WOODIE FLOWERS

ONE OF **EIGHT** ORIGINAL AND SUSTAINING **FRC TEAMS**

ROBOWRANGLERS.COM

EXPANDED DISTRICT ROBOTICS PARTICIPATION FROM **29** TO **500+** STUDENTS IN **5** YEARS

100% OF SENIORS IN THE PAST 6 YEARS ATTENDED COLLEGE

Started over one hundred

competition robotics teams in our district in the past 3 years

SEVEN ROBOWRANGLER ALUMNI ARE CURRENTLY BRINGING THEIR EXPERIENCE FULL CIRCLE BY BECOMING MENTORS

ORIGINAL TEAM ESTABLISHED IN 1992

OLDEST TEAM IN TEXAS

ROBOWRANGLERS

3 MEASURES OF SUCCESS

- HAVE FUN
- MAKE FRIENDS
- CHASE EXCELLENCE