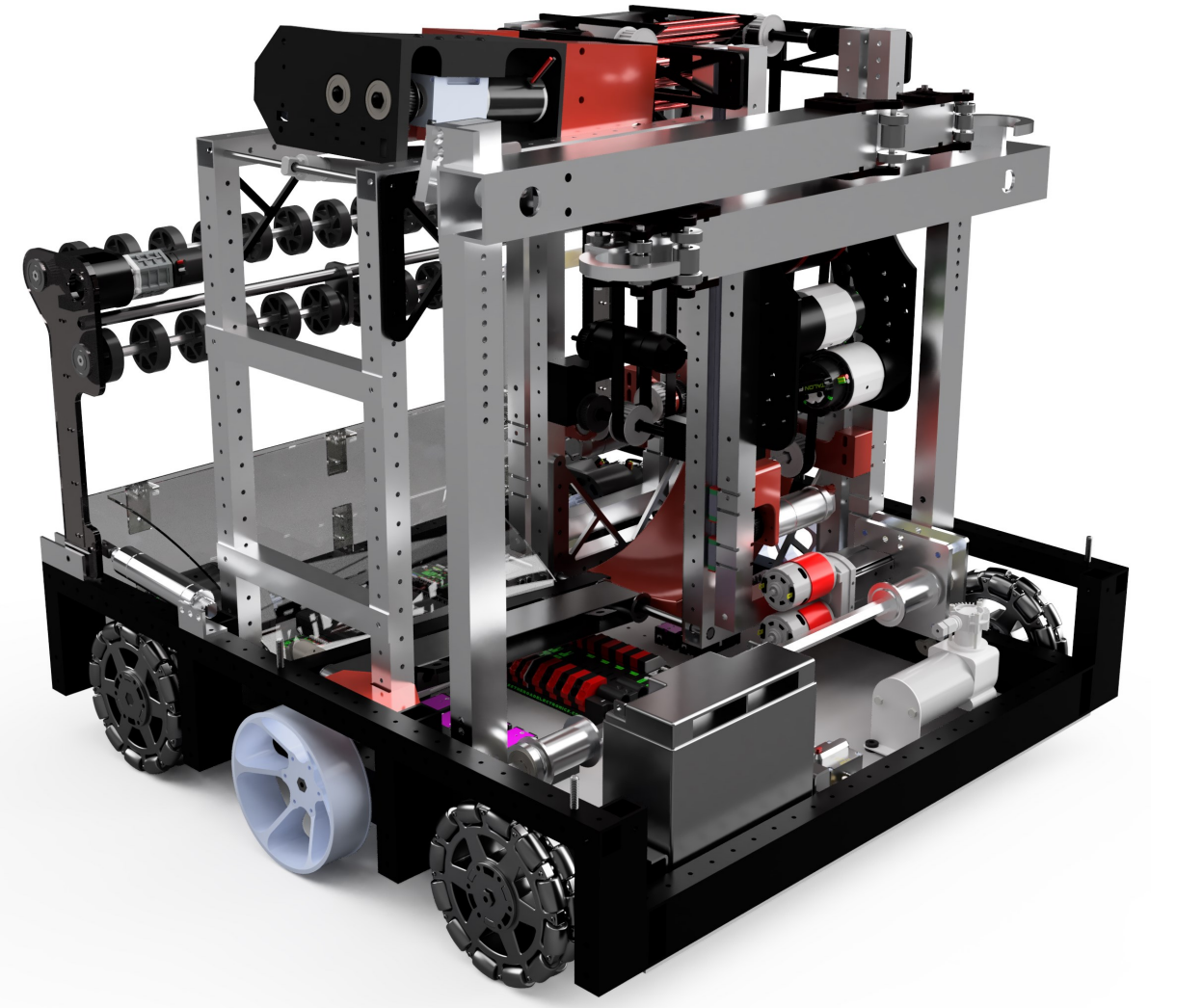
FIRST Team 1987
The Broncobots

2020 Technical Book



5,317 Student Hours

29 Students

This student led team designed, built, and programmed this robot. Students designed the robot in Fusion 360 and programmed in Java. Mentors stepped in when needed.

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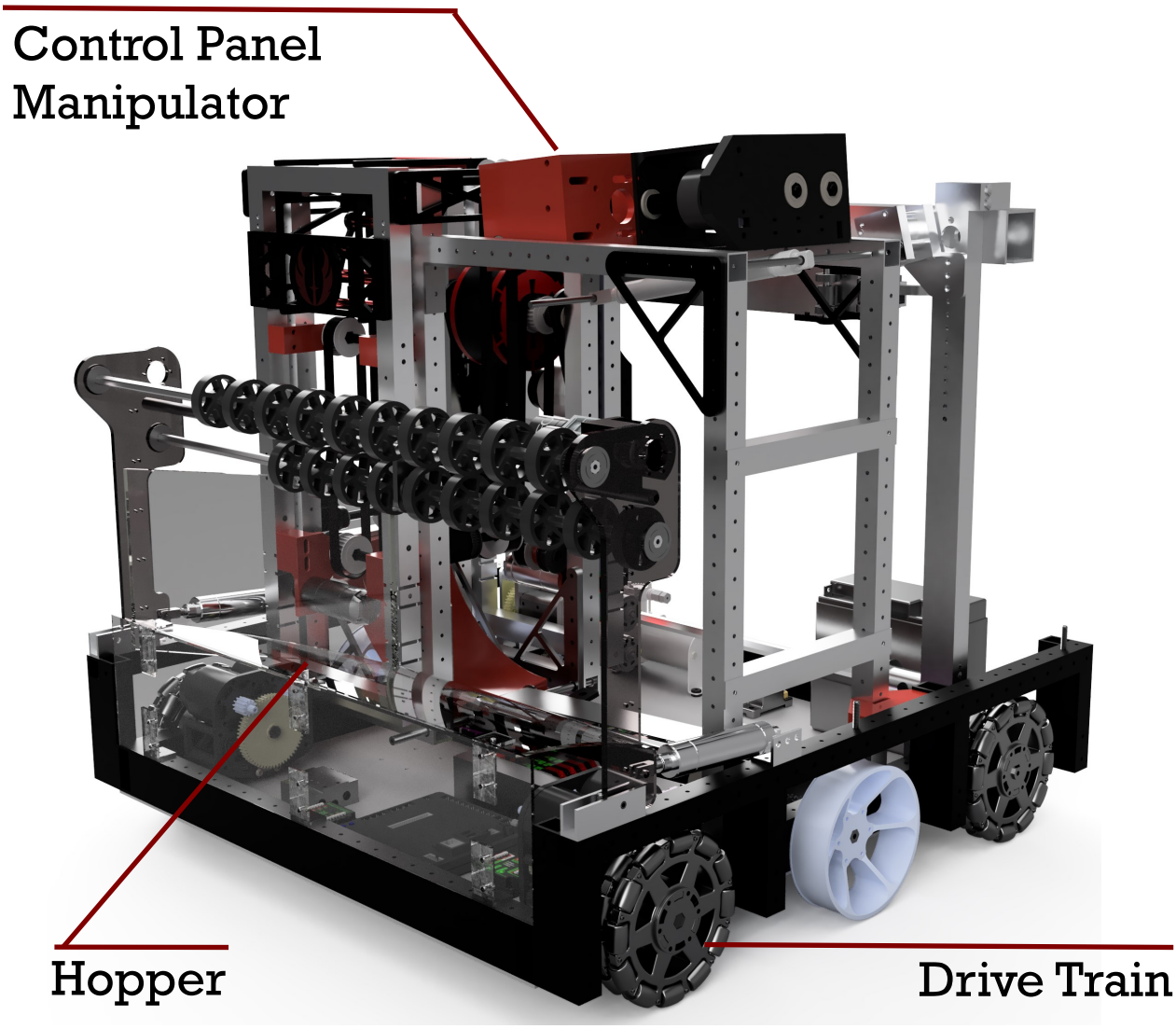
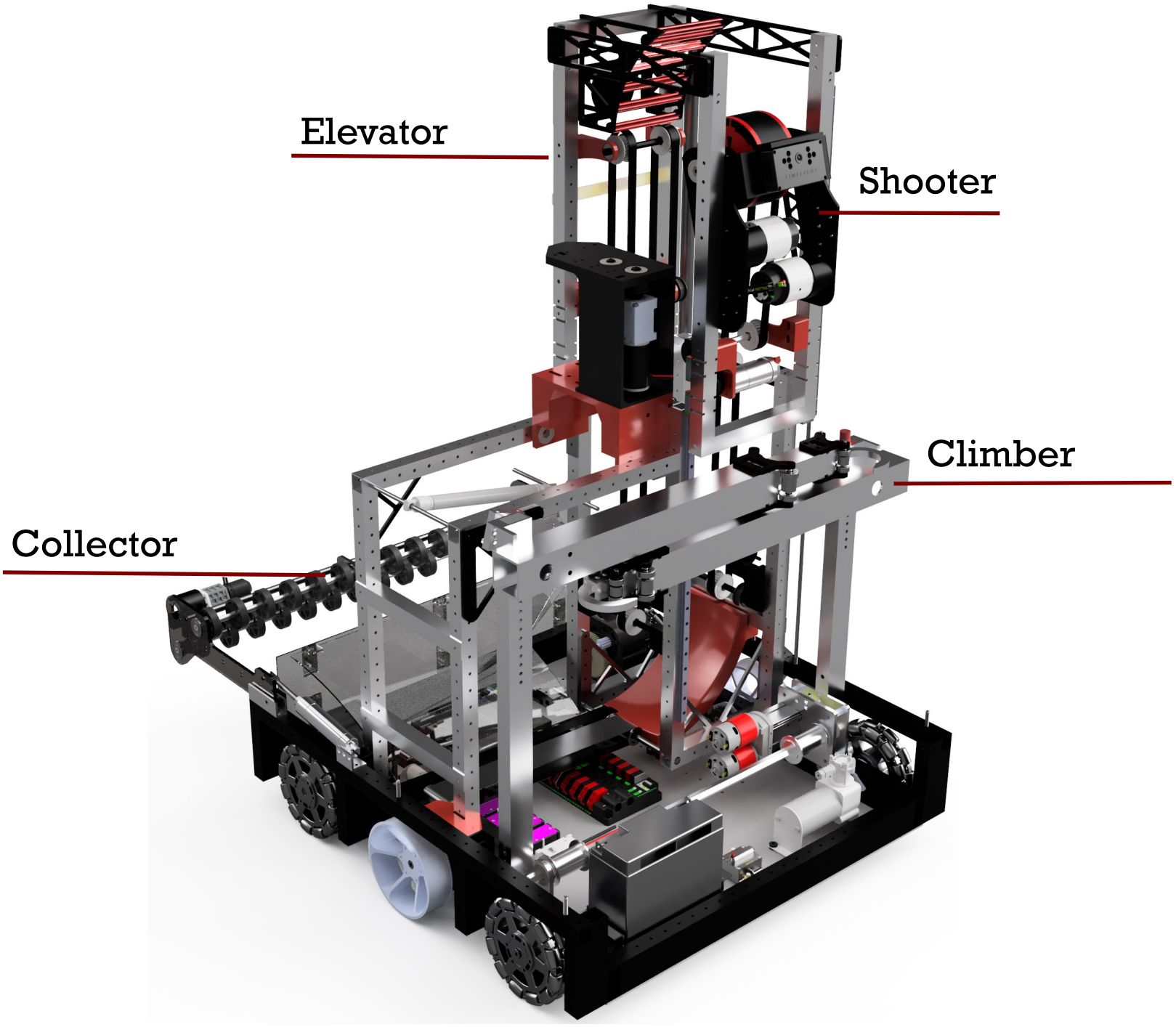
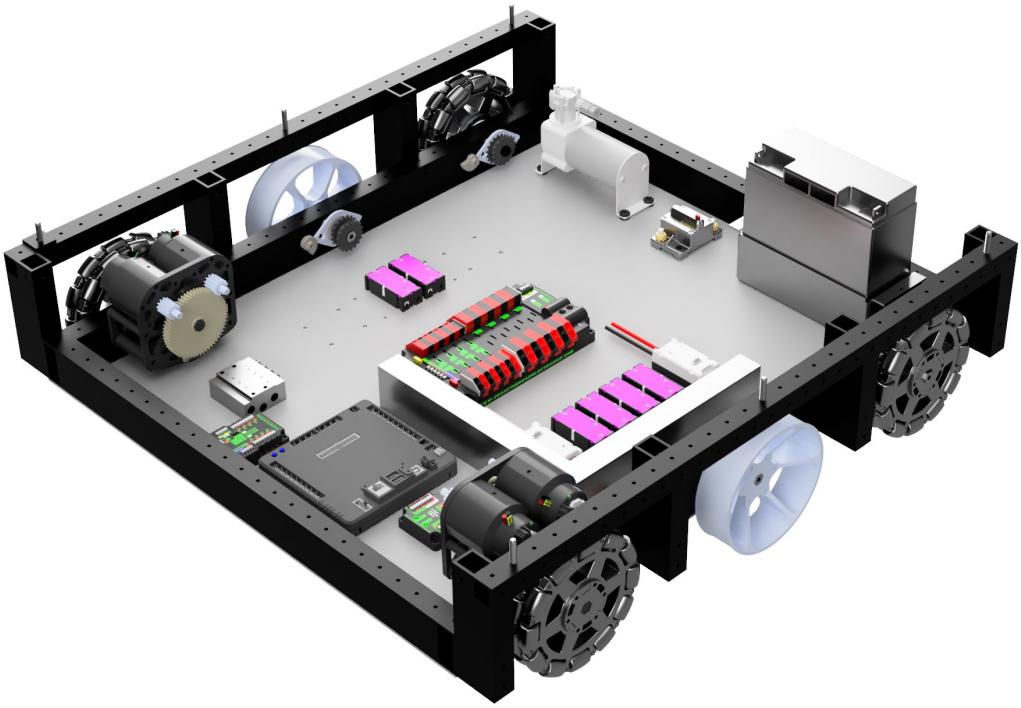
OUR ROBOT




Elevator
Shooter
Climber
Collector

DRIVE TRAIN

Mechanism



- Two 6 inch performance wheels
- Four 6 inch Omni-directional wheels
- West coast drive 4 Falcon 500 single flipped gearbox
  - 16.35 feet per second
- Uses the Falcon 500's integrated encoders to track drive distance for autos

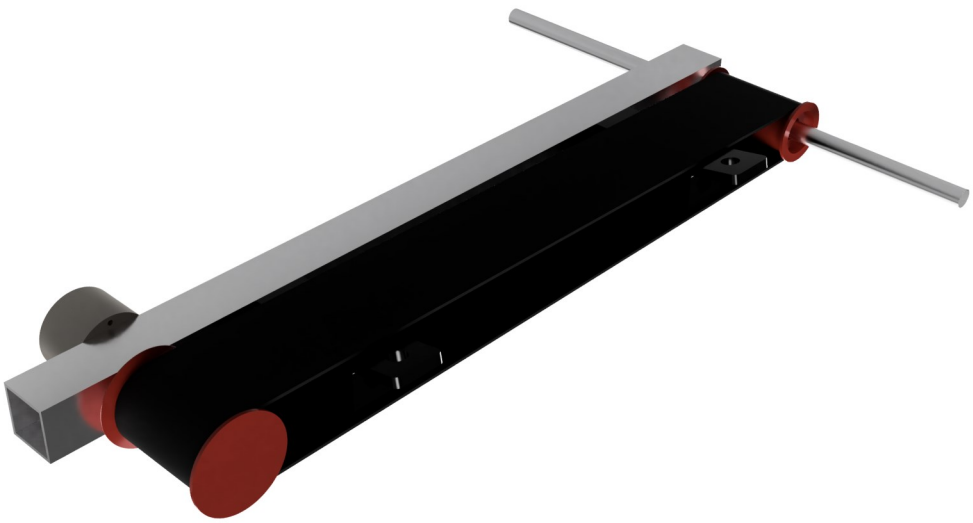
COLLECTOR

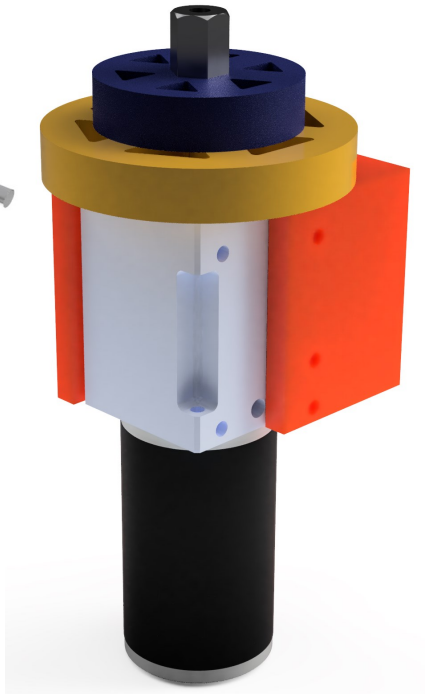
Mechanism

- Custom water-jetted 2” compliant wheels on two 3/8” hex shafts
- Horizontal intake wheels driven by a Neo 550 brushless motor with a 5:1 gearbox
- Pivots up and down by two 7/8” bore pneumatics with 2” throw
- Easy cut strip brushes lined along a support bar to guide Power Cell into hopper

HOPPER

Mechanism

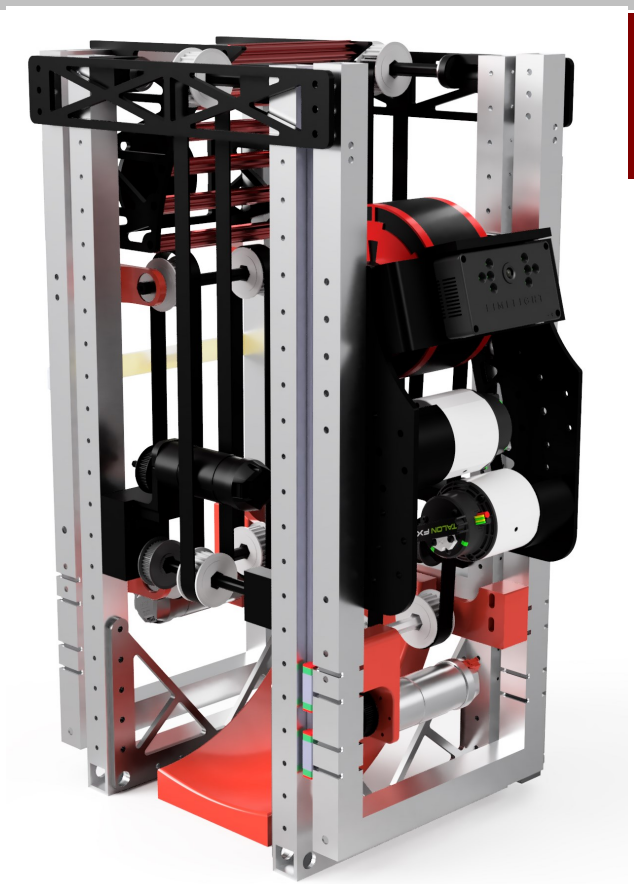




- 2 inch hopper poly belt, driven by a 20:1 NeveRest motor
- Power Cell agitator wheel that runs off a 30:1 bag motor to help with indexing
- Once the Power Cell is collected it moves on a sloped lexan piece down to the poly belt

ELEVATOR

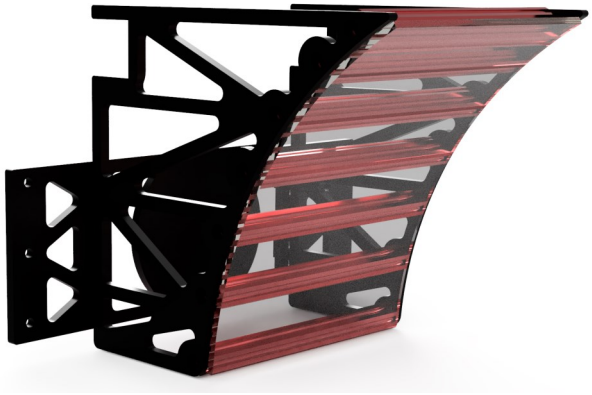
Mechanism

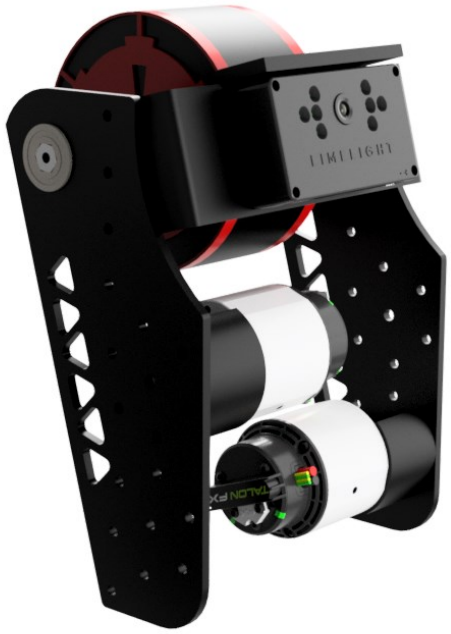


- One stage elevator run by two 3/4” bore pneumatics with 16in throw
- Instead of using bearing blocks on our elevator we used linear rails
- Power Cell travels to shooter through timing belts run by an Andymark 9015 motor with a 20:1 gearbox
- Has two constant force springs for added support

SHOOTER

Mechanism

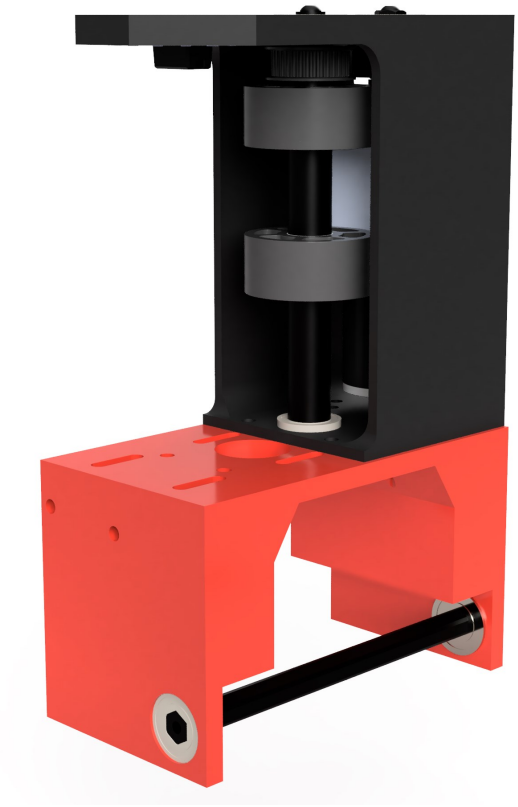


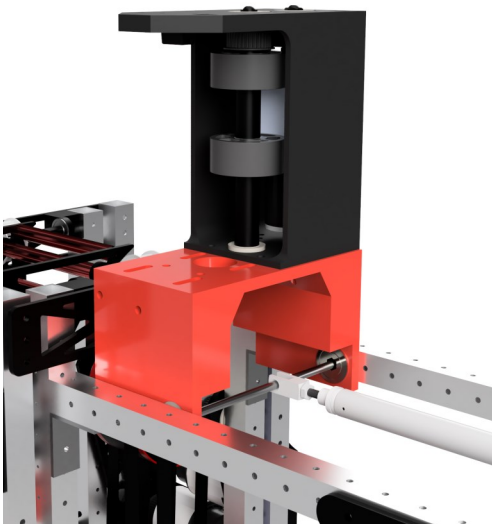


- Two Falcon 500s powered on a 2:3 reduction
- Uses the Falcon 500's integrated encoders to track the flywheel's angular velocity
- 5 inch Fairlane wheel
- Aluminum watterjetted structure
- Custom Lexan hood

CONTROL PANEL

Mechanism

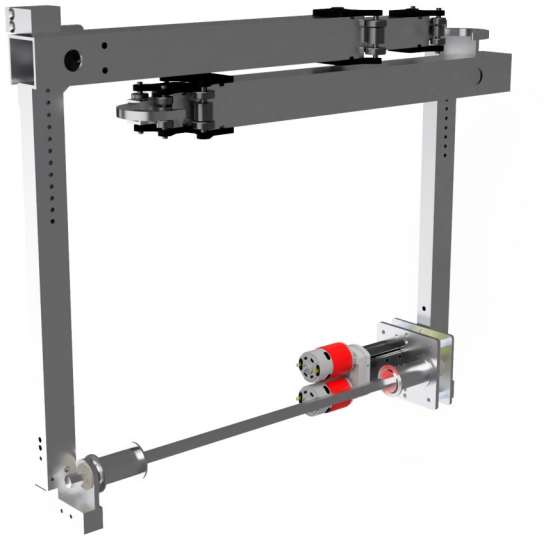




- 3d printed structure
- Two compliant wheels to rotate control panel
- Uses a bag motor with a 30:1 gear ratio to power
- LED ring assists the color sensor to read control panel colors
- Pneumatically actuated vertically

CLIMBER

Mechanism

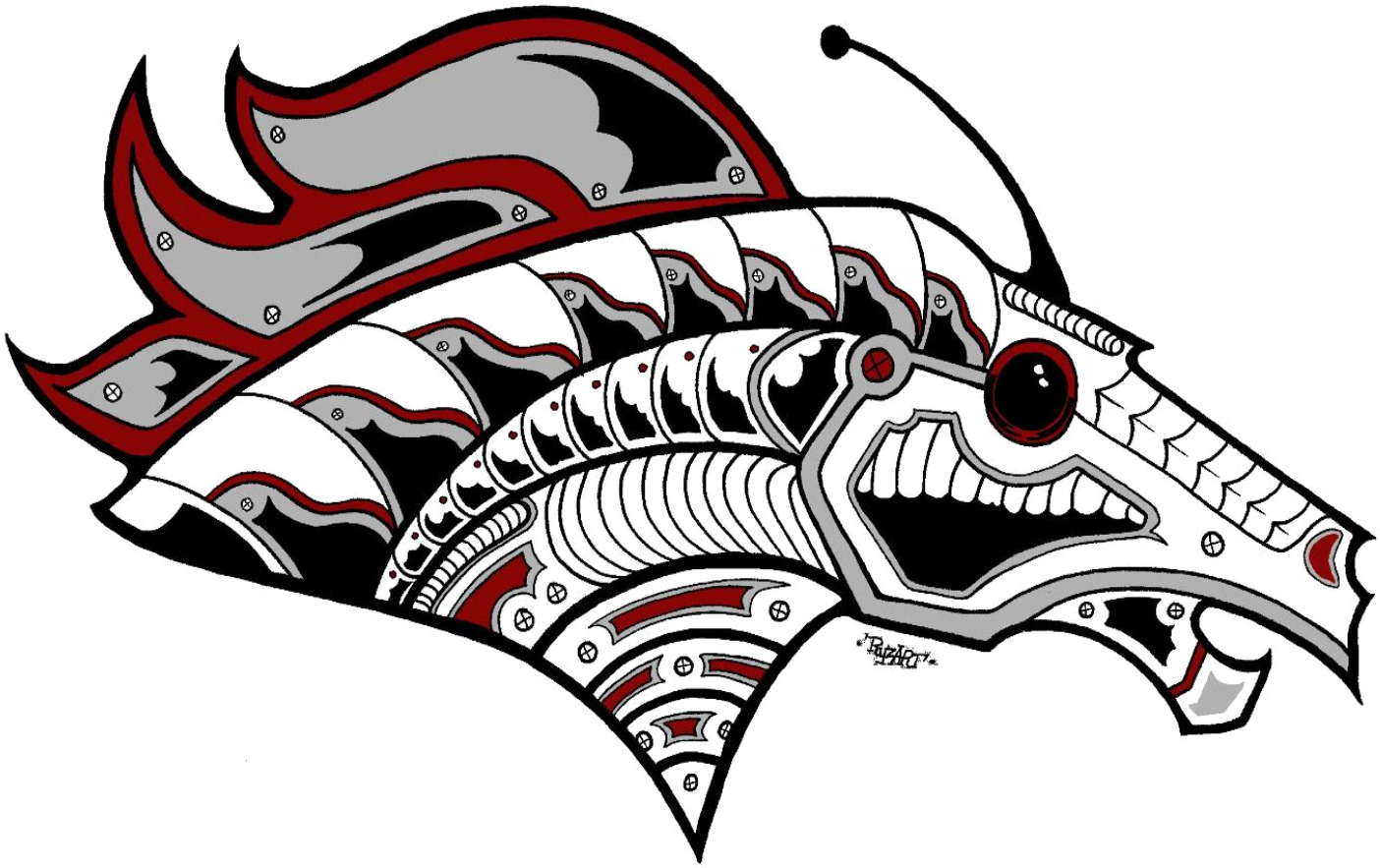


- Dual collapsible 3-stage extending arms
- Various constant force springs to extend arms in seconds
- Dual Redline motors with Sport gearbox for winching
- Custom made hooks
- Adaptable climbing configurations
- Fits under control panel

PROGRAMMING

Software

- Limelight™ camera mounted under the shooter's flywheel used for fast and accurate aiming during auto and tele-op
- Shooting speeds are determined by the distance measured by the Limelight™ and an interpolating tree map
- PID control with feedforward used for shooter RPM
- State machine used to integrate hopper, elevator and shooter subsystems so that they all run autonomously
  - Automated hopper and elevator loading with accurate ball count
  - Automated aiming and shooting sequence
- Autonomous commands use spline driving to create drive paths
- Automated control panel for both rotation and position control
- Unit testing of subsystems and commands



PROGRAMMING

QR Code

Scan to see our robot code

URL: https://github.com/FRCTeam1987/Robot2019

Organization: FRCTeam1987