

ROLLING THUNDER DESIGN SUMMARY

Team 1511: Penfield, NY

“Darth Thunderous the Wise”

Robot Design Mission Statement:

A robot that can climb quickly in any scenario; rotate and position the control panel accurately and quickly; score power cells in the outer port; and either do full-field runs to retrieve balls from the loading bay, or pick up cells on our offensive side of the field.

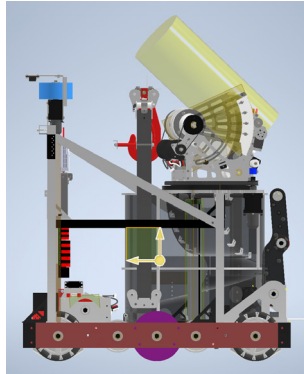
Overall Stats:

- Robot Weight: 123 lbs
- Robot Dimensions: 28 wide x 32 long x 34” tall (with the hang mechanism retracted)
- Total number of motors: 14 (NEO and NEO 550)
- Total number of sensors: 12
- Total number of servos: 2



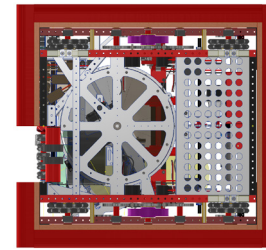
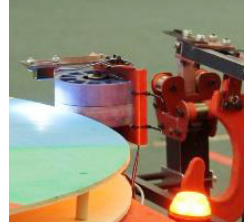
Engineering Design Process:

- Wiki engineering notebook (The Wookiee)
- Iterative design cycle: Strategic Mind Map → Concept → Prototype → Design → CAD → Fabrication → Assembly → Test → Repeat
- Student driven CAD using Autodesk Inventor
- Center of Gravity, weight control, and stress analysis on CAD
- Easy maintenance and future improvement part of iterative design
- In the works:
 - Remove intake “hot dog” bar
 - Integrate and test the turret
 - Implement traveling hook design



Drive Base and Frame:

- Drive base has a 80:11 gear ratio
- Combination of gear and belt drive
- Top speed of 15.5 ft/sec
- Welded frame construction
- Two on-axle REV hex encoders

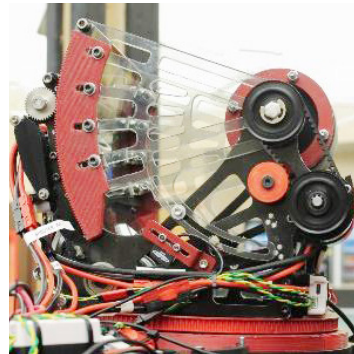
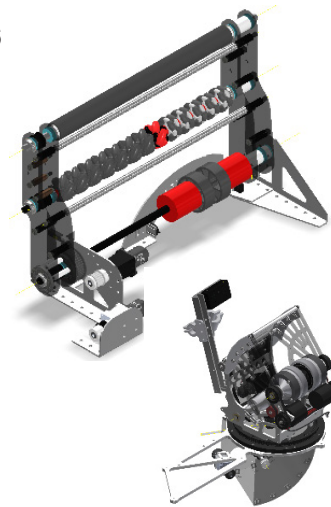


Control Panel:

- Automatic rotation with REV color sensor
- 16:1 gearbox for control panel wheel
- Rotation control in 4 sec, position control in 1 sec

Intake and Helix:

- Pivot has a 100:1 gearbox and an 18:36 pulley ratio
- Wheel/bar spins with a 16:1 gearbox
- Rubber “hot dog” bar contacts power cells (touch it, own it)
- 3D printed mecanum wheels direct power cells to slot in drive base
- Optical switch positions the intake pivot
- Optical sensors on drive base counts entering power cells
- Brush-driven Archimedes’ Screw design drives power cells up to the shooter
- Helix brushes have a 25:1 gearbox
- Shooter transition wheel has a 7:1 gearbox

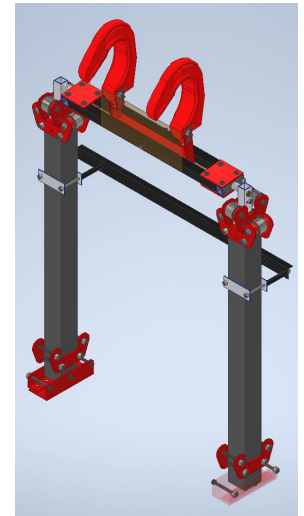


Shooter:

- Shooter has a 2:1 pulley ratio
- Primer wheel has a 12:1 gearbox
- Turret has a 178:18 pulley ratio
- Adjustable hood with servo presets
- Consistent scoring in outer port
- Rapid fire shoots 5 balls in 1.7 sec
- Color sensor recognizes power cells at top of helix/transition wheel
- Optical sensor tallies power cell shots
- Limelight for shooting and targeting

Hang:

- Two custom 3D printed hooks
- Constant force spring deployment
- Winch retracts with a 16:1 gearbox with 5:1 gear ratio
- Ratchet and servo-operated pawl brake for sustained hanging whilst disabled
- Gas springs on vertical bars to eliminate tilt and swing
- Less than 7-second hang time
- Hooks mount to a self-leveling mechanism
- Optical sensor indicates full retraction



Autonomous Modes:

- Start touching either guardrail, drive forward, turn towards power port, drive, and shoot
- Start lined up with the power port, drive forward to driver station wall, and shoot
- Start lined up with the power port, shoot from the initiation line, then back up

Controls and Programming:

- Driver Controls are styled like the Death Star™ controls
- Front camera allows drivers to see intake and across the field
- Broken switches to override sensor malfunctions
- Programming in C++
- Limelight for shooting and targeting
- Drivers use sensor-driven LEDs for ball-counting

