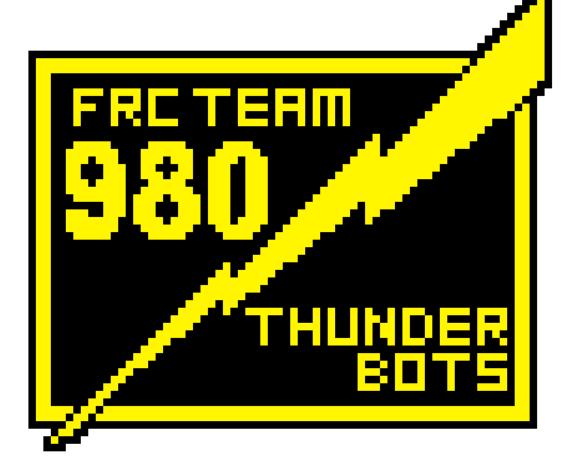
FRC Team 980 ThunderBots

Engineering 2018





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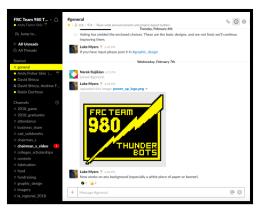
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Organizing Tools

Slack for our team communications



GitHub for controls

This organization Search	Pull requests issues Marketplace Exp	store 🌲 + - / -	
980 Team980			
Repositories 15 AL People @			
Pinned repositories			
2018 Code for the 2018 robot	2018-Coprocessor Code for the Rioduins coprocessor on the 2018 robot. Deals with sensors so the robot doesn't have to.	ThunderScout-Android Team 980's FRC Scouring app	
●Java ★1	●C++ ★1	●Jasa ★10 ¥5	
Search repositories		Type: All + Language: All +	
2018 Code for the 2018 robot		Top languages	
java fre fre-power-up		Java C++ D	
Java #1 Updated 14 hours ago		Most used topics	

Google Drive for cloud storage

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	NEW	My Drive > FRC_Team	1980 > 2018_Season
•	My Drive	Folders	
	Shared with me	FIRST-FRC18-Power	Team Power Up Bra
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	Google Photos	Files	
*	Starred	FRG Team	FRC Team
Î	Trash	980	980
2 GB	of 30 GB used	ThunderRets	ThunderBats
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Trello to keep our projects on-track

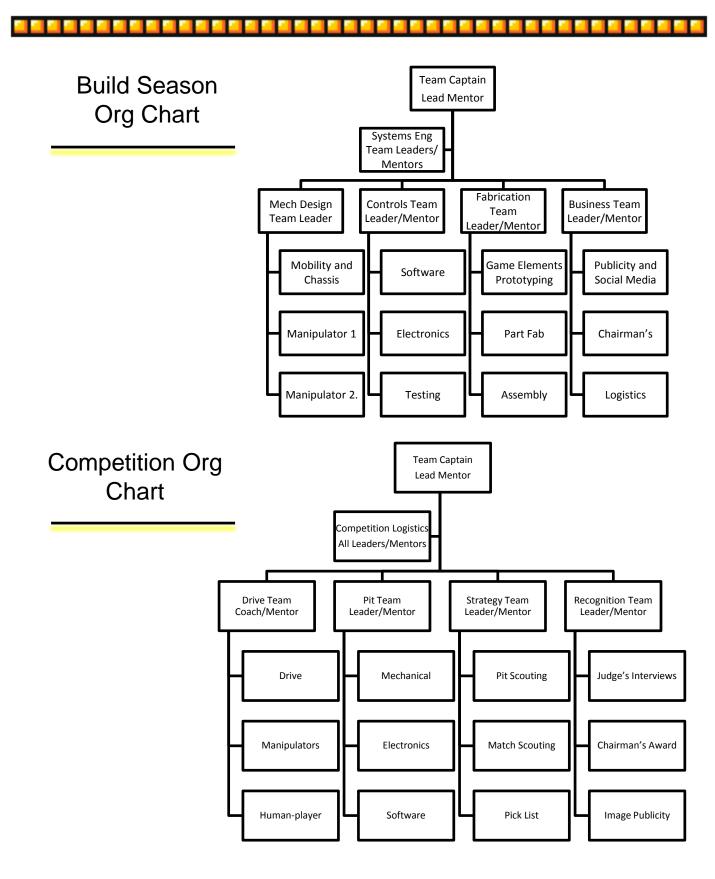
Boards D		G	Trello	+ 🚺 Robin Dorfman 🔘
KRC Team 980 ThunderBots	Boants & Members © Setting	ß		
2016 Game: FIRST STRONGHOLD	2017 Chairman's	¢	2017 Entrepeneurship 🔥	2017 Game: FIRST
Business To-Do	Chairman's Video	Ŷ	Discovery Cube - FLL Qualifier	Discovery Cube - May Robotics Day
Outreach	Publicity		SponsonsiGrants	Create new board

GrabCAD for SolidWorks















ThunderScout



Tablet-based. custom scouting software designed by team member Luke Myers. Available now on Google Play, Amazon and GitHub.

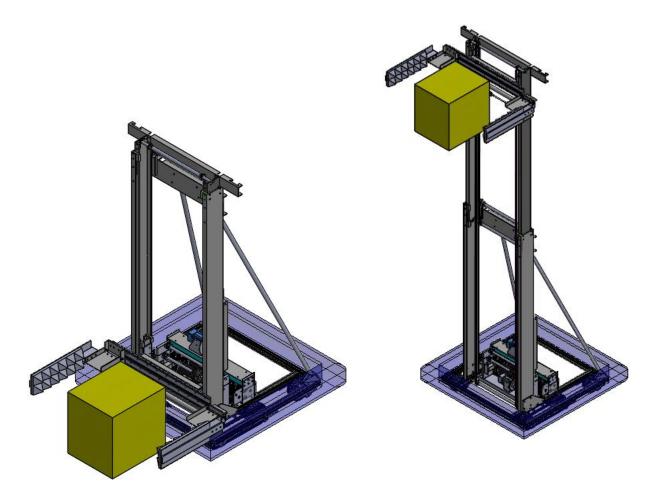








Complete Robot



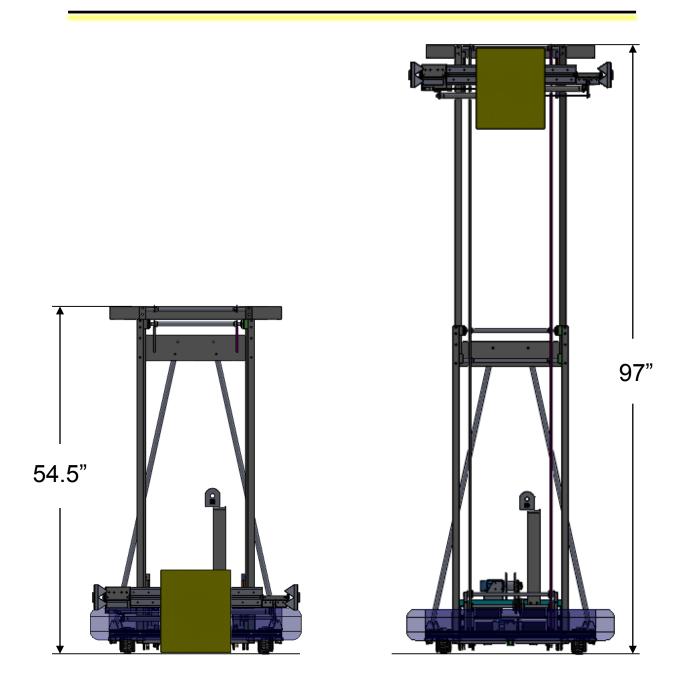








Front View





Page 7 POWE



Lifting Assembly



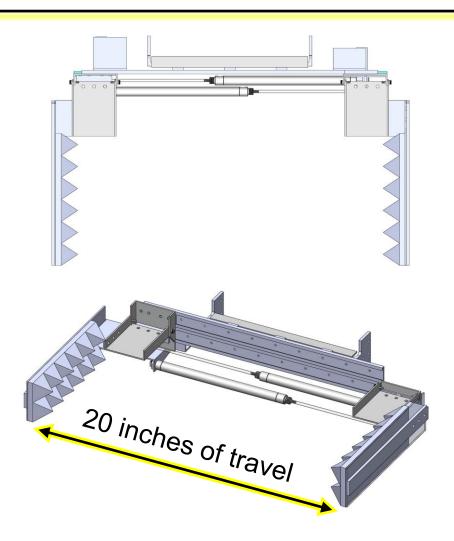
 Torque Limiter to prevent motor from causing damage







Power Cube Pick Up



○ Up to 90 lbs. of clamping force

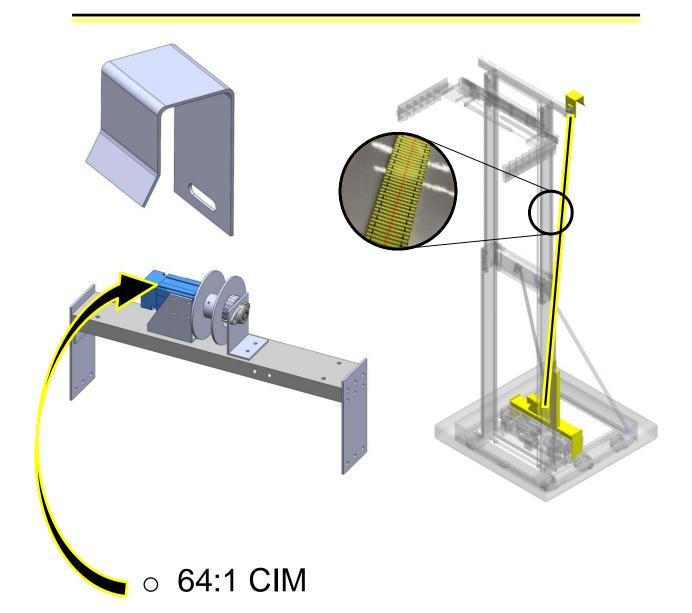








Climbing Assembly



Over 650 lbs. of lifting force



Team 980: Engineering 2018

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Lightning XVI: Robot Controls/Operations

Autonomous Modes

Mode 1: Switch Scoring

- Center start position
- · Determine active switch from FMS string
- Deliver cube to active switch via vision targets within 5 seconds
- Drive around switch, find and capture a new cube Sensors used: Pixy imager, ultrasonic rangefinder, rotational encoders, Pigeon IMU

Mode 2: Scale Scoring

- · Side start position
- Drive to nearest scale
- If FMS string indicates scale is active, score cube. Otherwise, hold cube, do not enter null zone.

Sensors used: ultrasonic rangefinder, rotational encoders, Pigeon IMU

Mode 3: Line crossing (Fail-safe mode)

- Any start position
- If Pixy/ultrasonic sensors not available, use encoders and IMU to drive across line.

Sensors used: rotational encoders, Pigeon IMU

Teleoperations

Pixy code is used in TeleOp for assisted cube capture. Velocity control to be used for driving (acceleration limited)







Lightning XVI: Robot Controls: Sensors

Sensor Fusion

We use a combination of target finding/ranging and motion control for acquiring cubes and delivering them to scoring platforms.

The target acquisition and ranging sensors below use a Rioduino coprocessor (MXP-compatible Arduino) for data collection and processing. Target direction/range data is sent to RoboRio via I2C.

- Pixy: small self-contained vision tracking unit. Tracks objects of a color, up to 7 color signatures. Provides size and position of object.
- Maxbotix ultrasonic: sonar-based rangefinder gives distance to object up to 6 m away.
- Mini LIDAR: Infrared based, uses flight time to determine range. Used to detect lift height, backing up the encoder data.

The motion sensors below are processed directly by the RoboRIO, providing data not dependent on the coprocessor. Integral for both Auto and Teleop modes, they allow for fail-safe auto mode that uses only these sensors in case of coprocessor failure.

- Pigeon IMU: 6 axis Gyro/Accelerometer/Magnetometer, self calibrates using Earth's magnetic field. Detects pitch, roll and yaw in degrees, delivers data over CAN bus.
- Rotational Encoders: mounted to drive wheels and lift motor, determines shaft rotations to calculate distance and speed and lift height in Auto.

Software

The Java RoboRIO code and C Arduino code were written side-byside by two students, making the sensor integration seamless.



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Lightning XVI: Drive Station

Shuffleboard is used for data presentation



X Box remote controls lifter, grabber, and climber





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