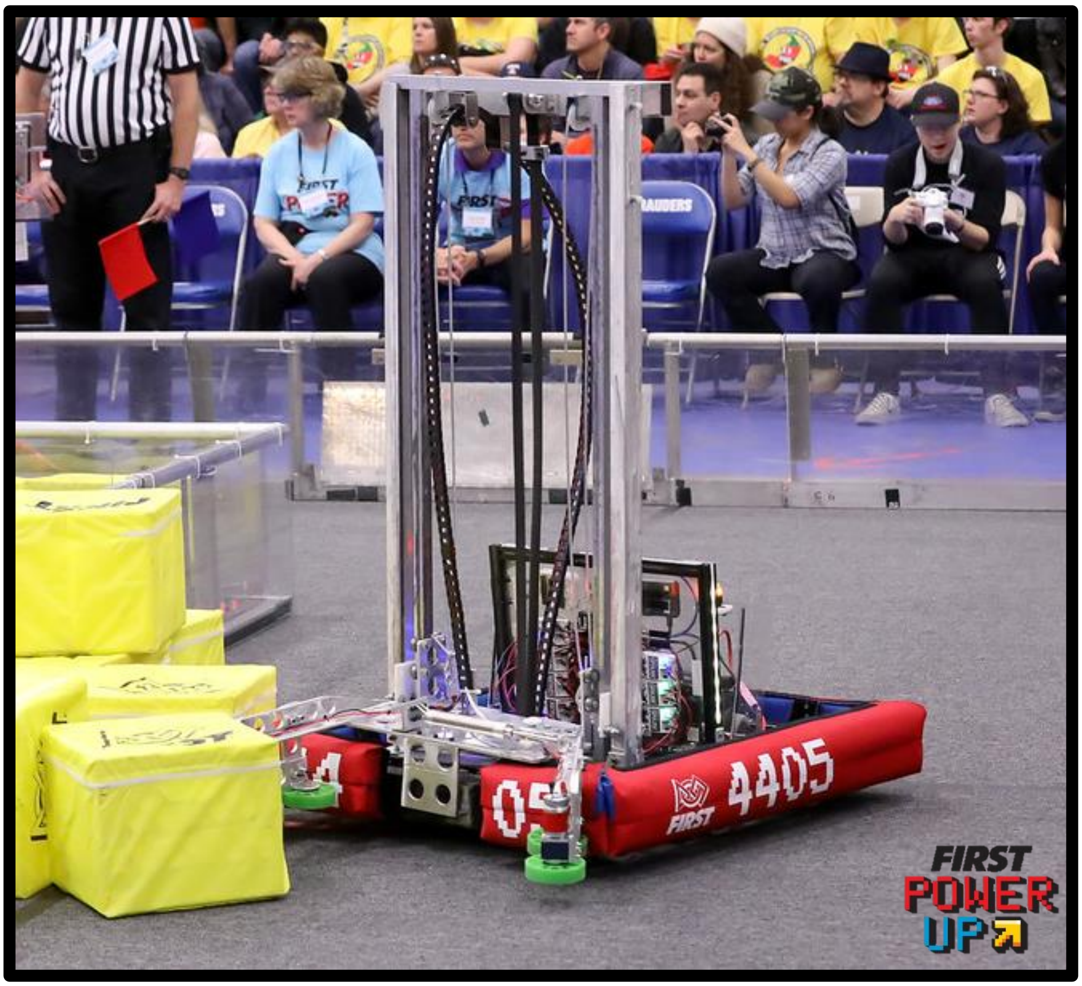
FRC 4405



Technical Documentation 2018

Table of Contents

FIRST Power Up Analysis

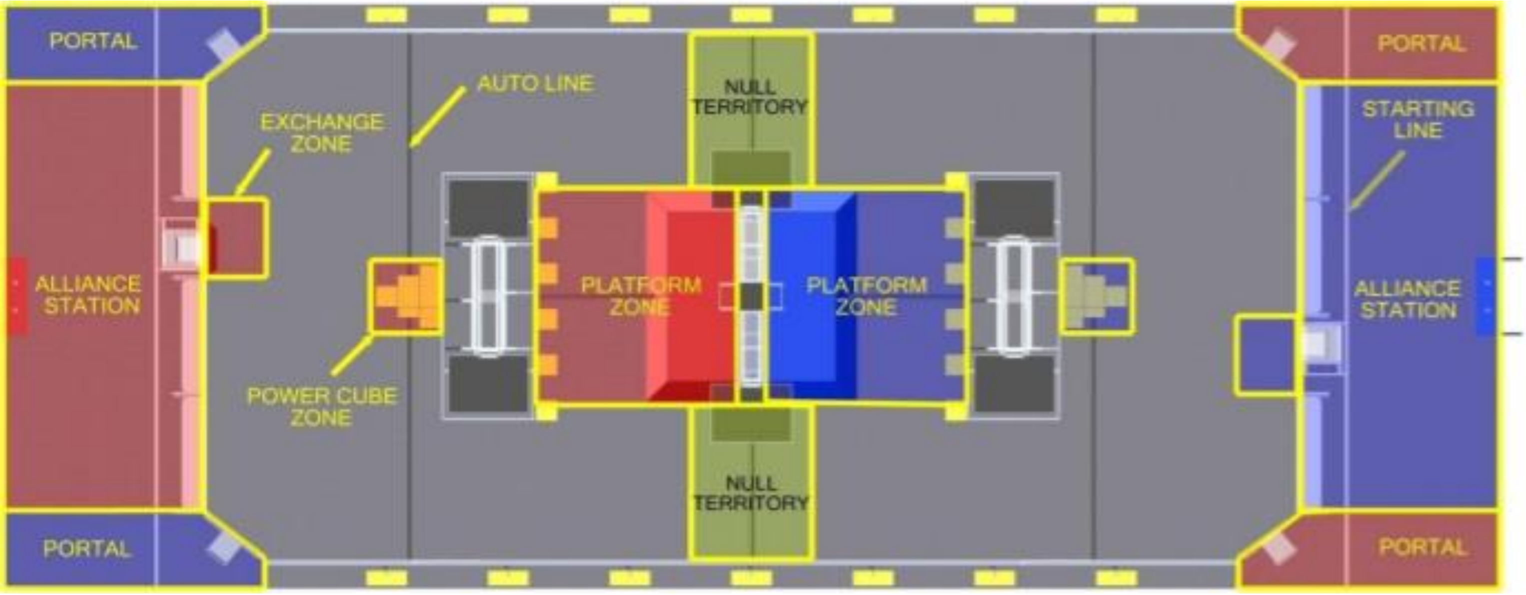
Scoring

Table 2-1: Autonomous Point Values

Action	Value
Cross the Auto Line (a.k.a Auto-Run)	5 points
Switch Ownership	2, + 2 points per second
Scale Ownership	2, + 2 points per second

Table 2-2: Teleoperated Point Values

Action	Value
Switch Ownership	1, + 1 point per second
Scale Ownership	1, + 1 point per second
Power Cube in Vault	5 points
Boost Power Up Bonus	2 points per second
Parked on Platform	5 points
Successful Climb	30 points



Game Description

In this year's game, 1 point is awarded to an alliance when the switches or scale is tipped in the team's favor. In autonomous, the points per second is doubled. A scale possession in autonomous is worth 2 points per second, as is the scale. Teams can place power cubes, found on the field, into a "vault." Each cube placed into the vault is worth 5 points. Once enough cubes are in the vault (maximum of 9), three power ups may be played: "force", "levitate", or "boost." Boost will give the team a two-times point multiplier for ten seconds, based on how many power cubes are in the vault when the power up is played. One power cube will multiply the switch. Two power cubes will multiply the scale. Three power cubes will multiply both. Levitate requires three power cubes, and awards one robot with a free climb (30 points) at the end of the match. Force gives the team control of the switch (one power cube), the scale (2 power cubes), or both (3 power cubes), for a period of ten seconds. Each power up can only be used once per match, per team. Two power ups cannot be played at the same time, and power ups will be placed in a queue if there is already another power up in play. At the end of the game, three robots will attempt to climb on a 16" bar, to a height of at least 12". Robots who achieve the climb (or use a levitate) will be awarded 30 points.

Priority List

1. <u>Drivetrain</u>
    a. 6-inch wheels
    b. High Speed Gear Ratio
    c. 28"x33" Frame Size

2. <u>Power Cubes</u>
    a. Pick up power cubes from floor
    b. Score power cubes on switch
    c. Score power cubes on scale at full height
    d. Score power cubes on scale at lowest height

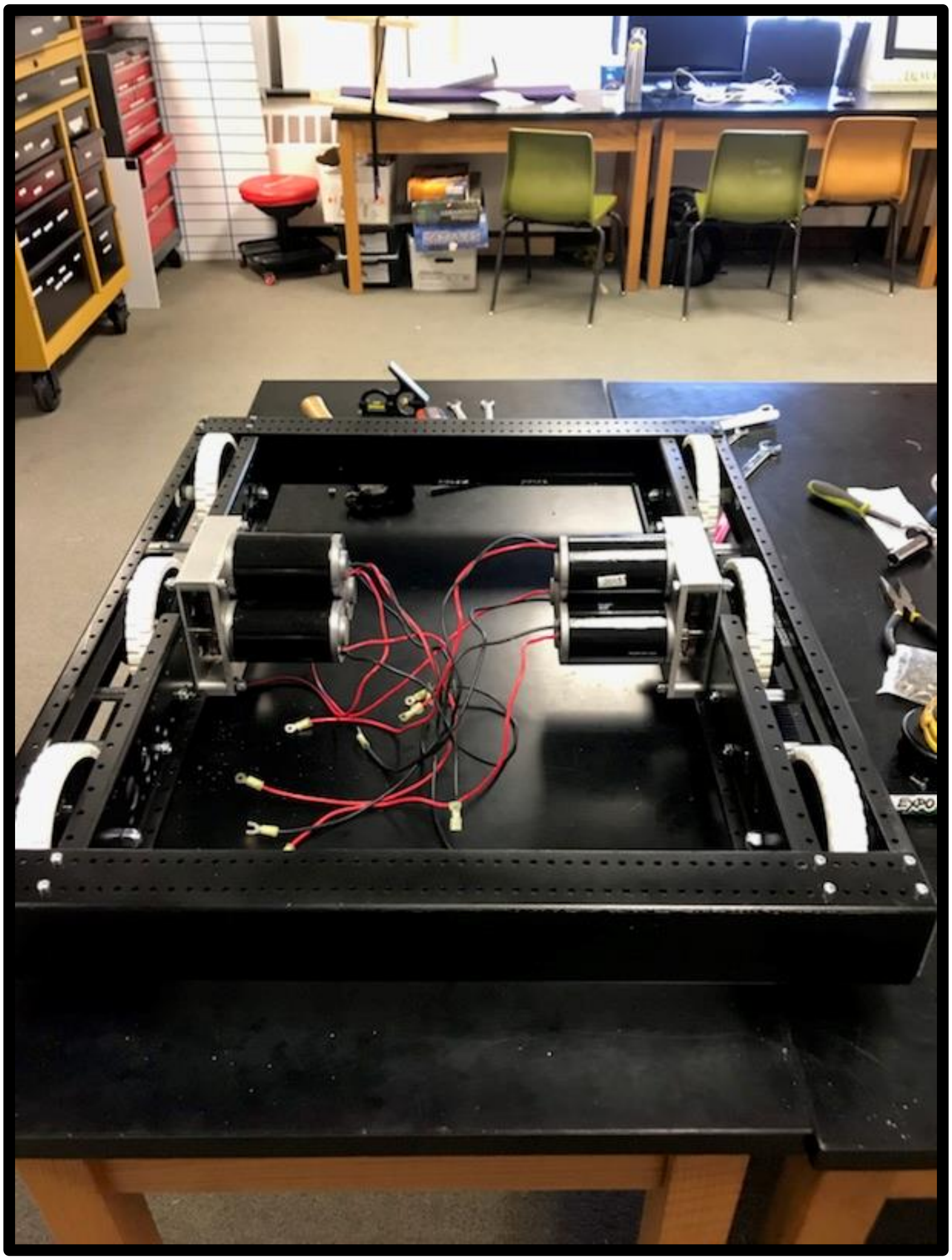
3. <u>Cube Retention</u>
    a. Pneumatic Actuator for power cube retention
    b. Electrical intake for power cube grabbing

This year, we wanted to create a robot that can accomplish every aspect of the game. This includes scoring on the switch, scale, climb, and exchange in both tele-op and autonomous. We have accomplished this goal, and have created a robust robot which accomplishes all of these tasks.

Design

Contents

Drive Base

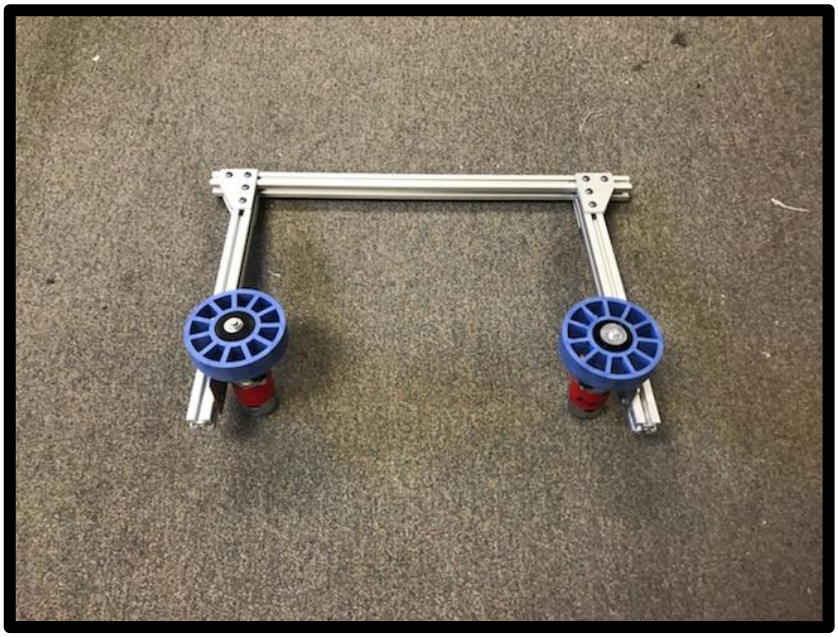


Kit of Parts AndyMark Drive Base
AM14U3

Power Cube Intake

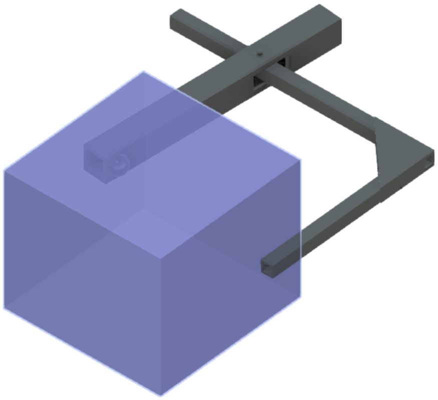
Prototype V1

- 775 Motor Intake



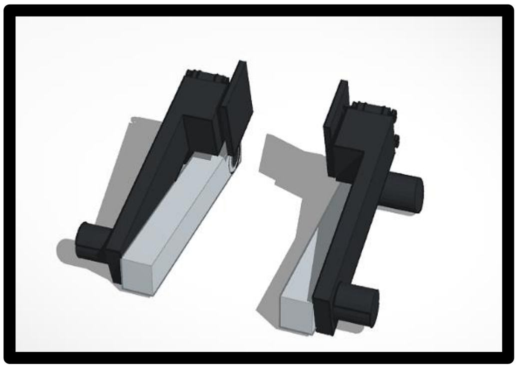
Concept V2

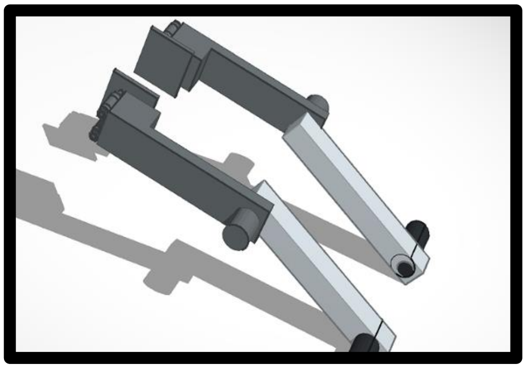
- Pneumatic "Claw" Intake



Unfolding Arm Concept

- Two-Stage Arm
- Unfolds Fully to 6' 5"





Pneumatic Claw Intake

Pros:

- Easy to build
- Reliable
- Minimal Moving Parts

Cons:

- No "Suck In" Action
- Added Weight from Compressor/Pneumatic Tubing

Unfolding Arm Concept

Pros:

- Unique
- Two Points of Motion
- Dual-Stage

Cons:

- Heavy
- Hard to Fabricate
- Intricate

775 Motor Intake

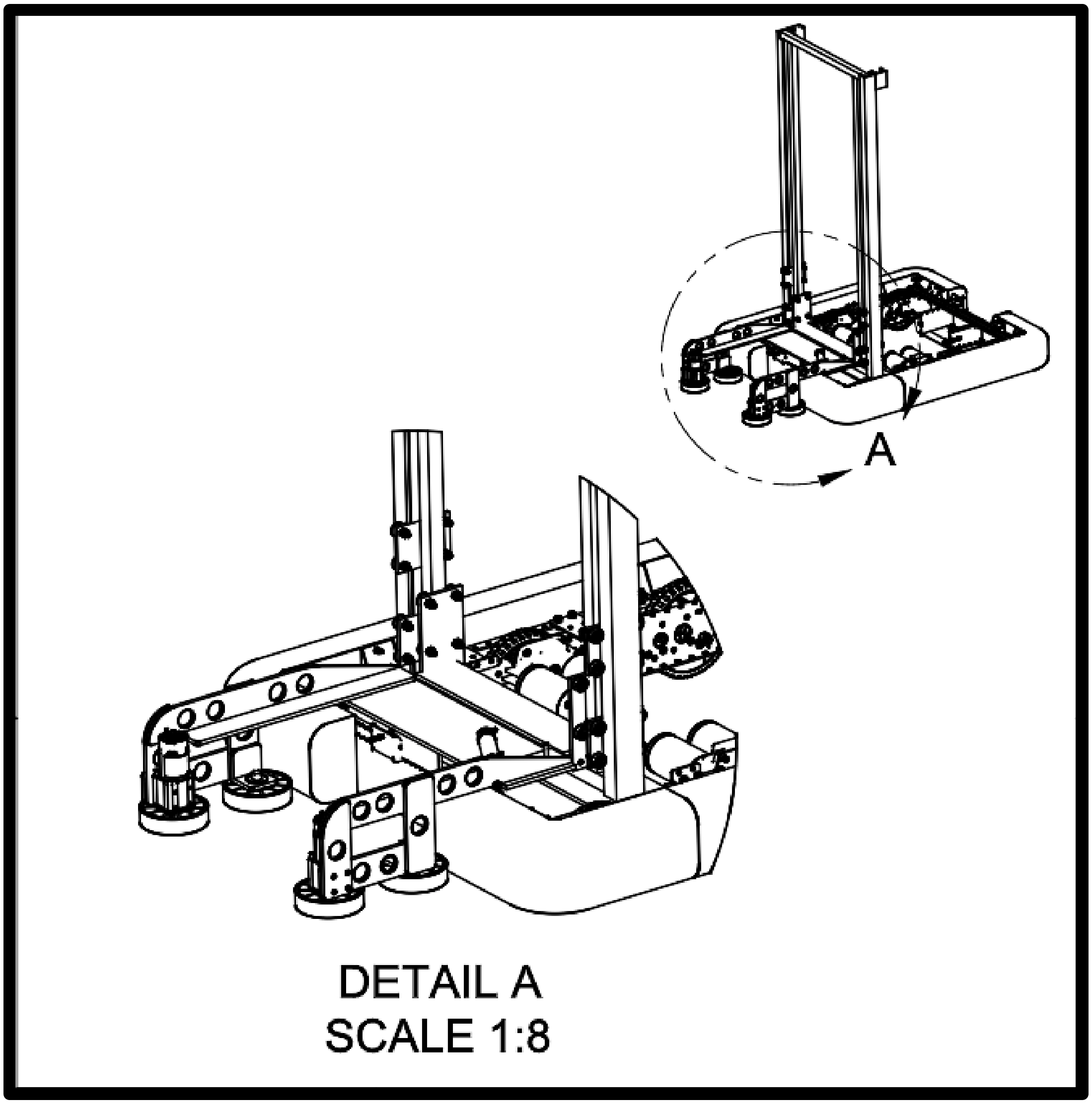
Pros:

- "Suck In" Action
- Easy to Fabricate
- Reliable
- No Pneumatics

Cons:

- Fixed Position
- Cannot Articulate

Final Intake Design



Pros:

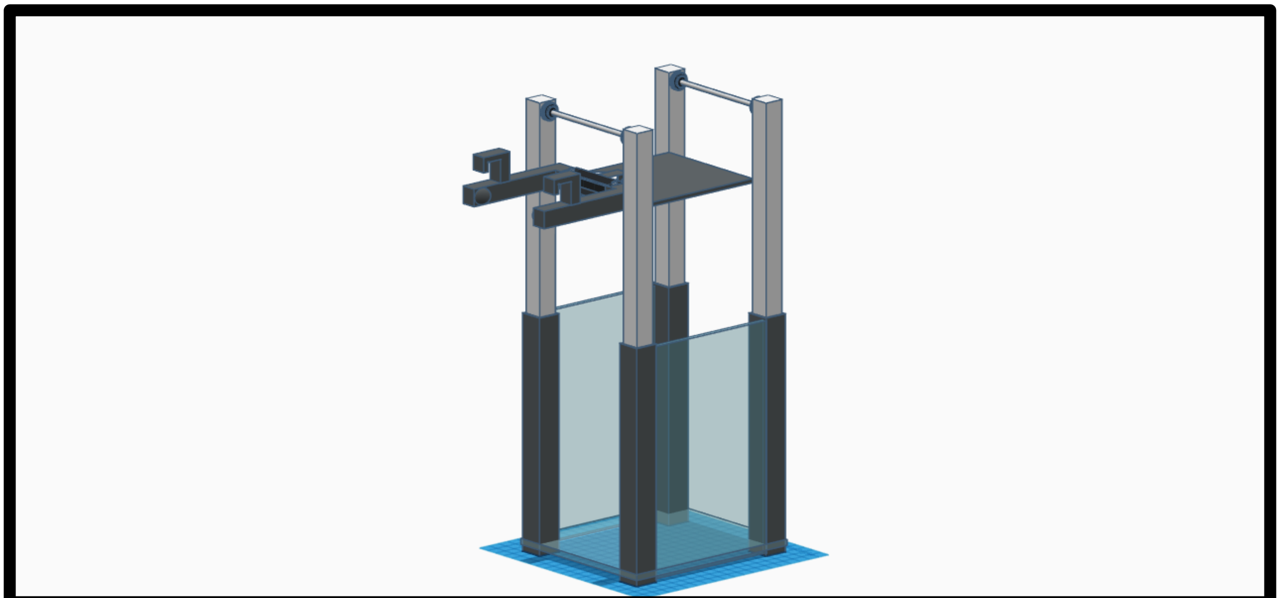
- *Pneumatically Actuated*
- *Two 775 Sport Motors for "Sucking In" Power Cubes*
- *Sucks in and Shoots Power Cubes*

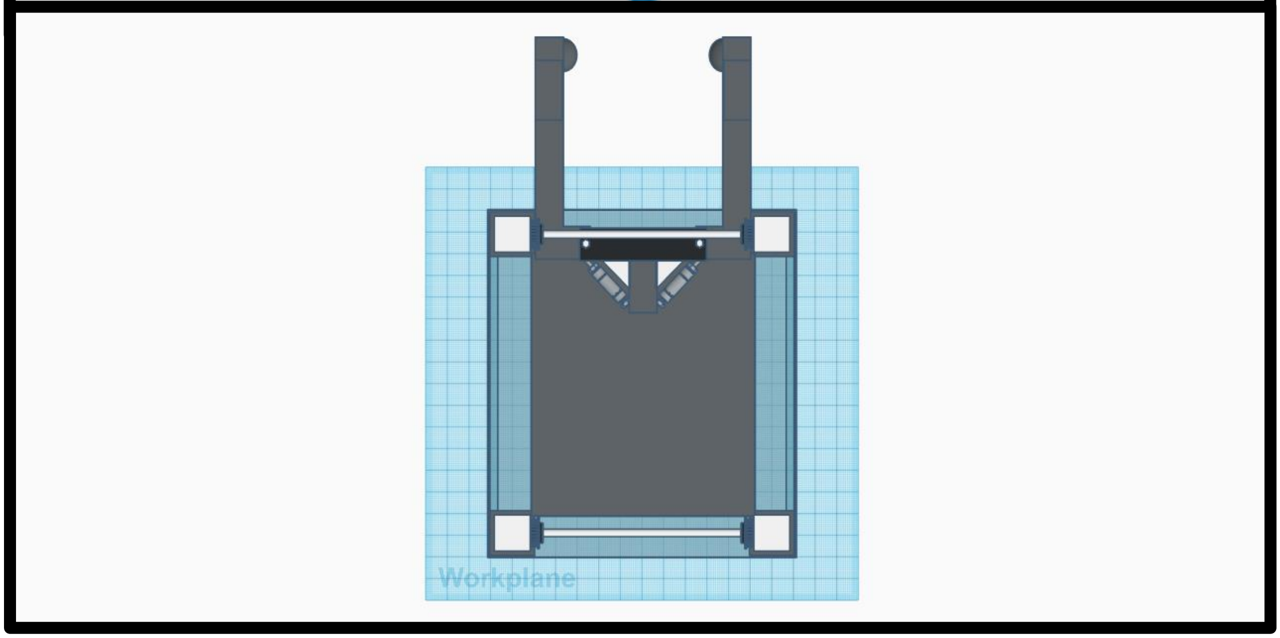
Cons:

- *Hard to Fabricate*
- *Extra weight from Pneumatic Tubes*

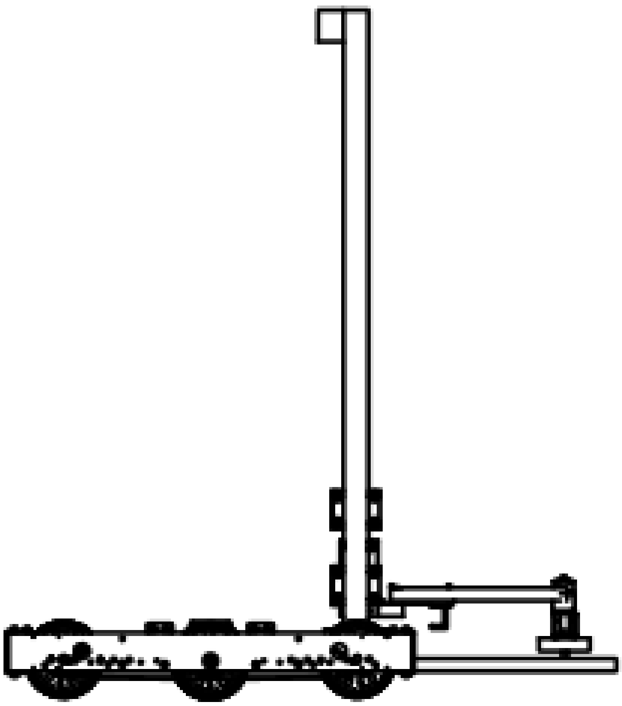
Elevator

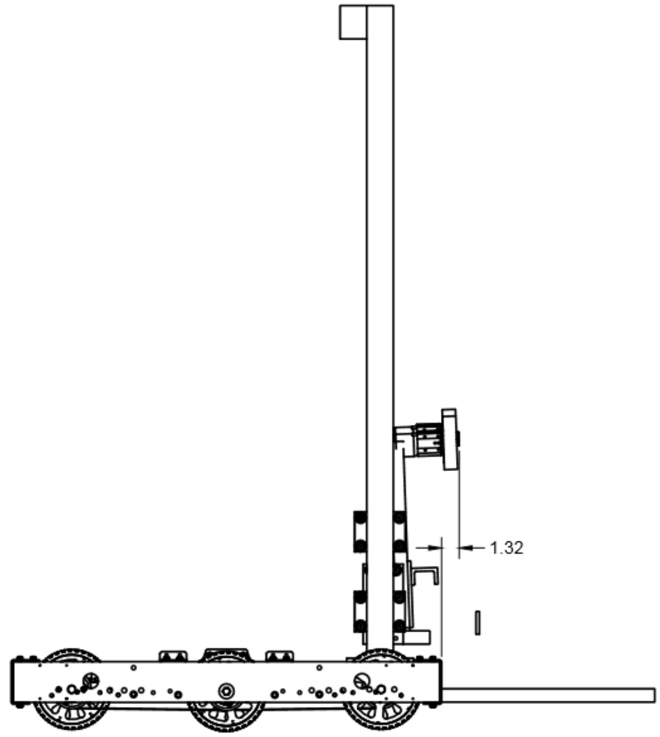
Elevator Concept Models



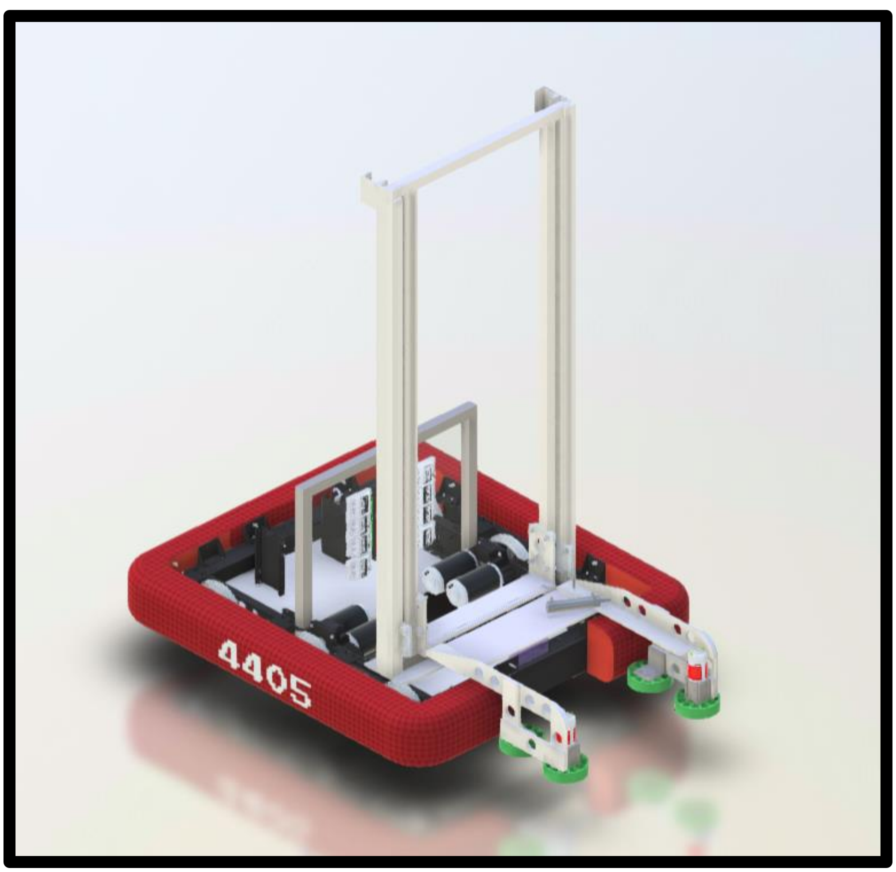


Elevator CAD Drawings



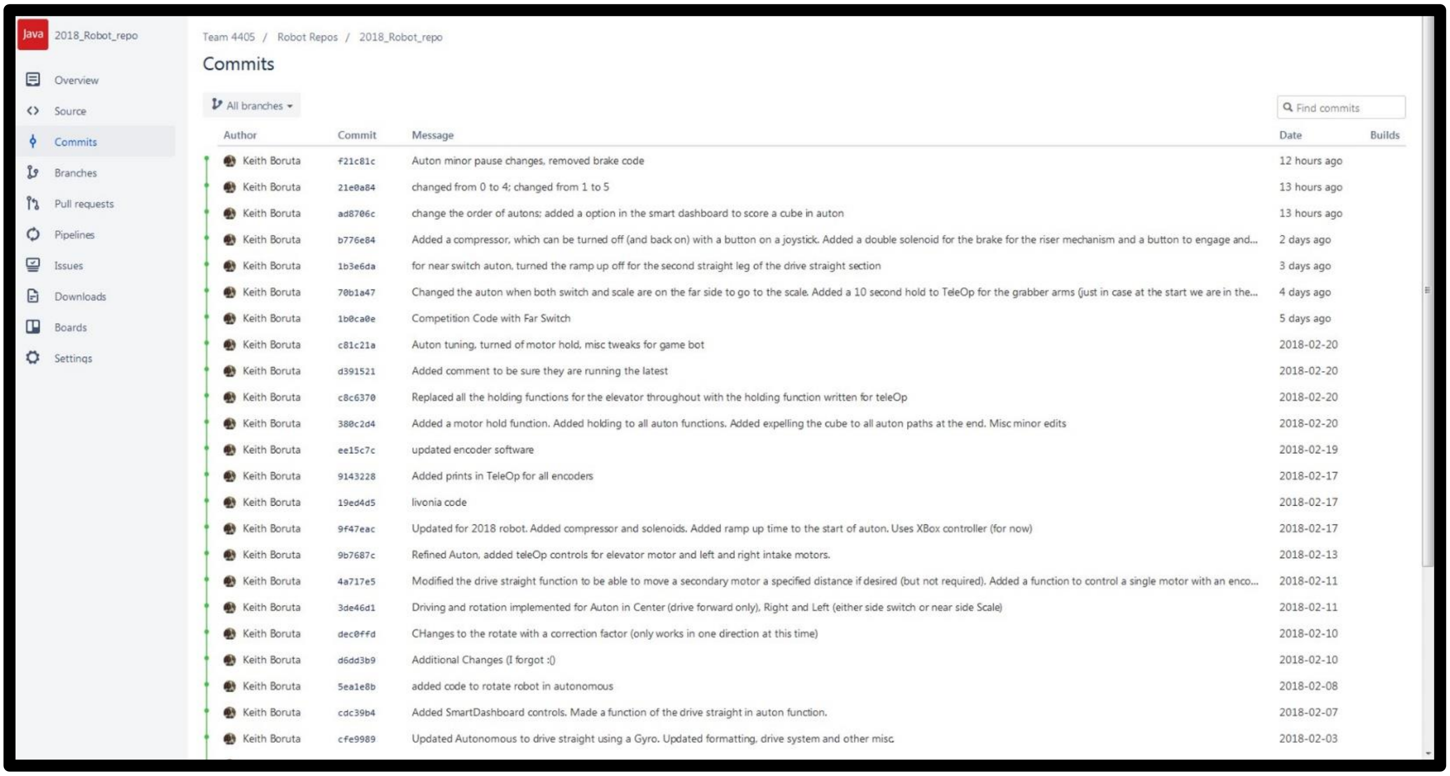


Final Elevator Design



Programming

Language: Java



Author	Commit	Message	Date	Builds
Keith Boruta	f21c81c	Auton minor pause changes, removed brake code	12 hours ago	
Keith Boruta	21e0a84	changed from 0 to 4; changed from 1 to 5	13 hours ago	
Keith Boruta	ad8706c	change the order of autons: added a option in the smart dashboard to score a cube in auton	13 hours ago	
Keith Boruta	b776e84	Added a compressor, which can be turned off (and back on) with a button on a joystick. Added a double solenoid for the brake for the riser mechanism and a button to engage and...	2 days ago	
Keith Boruta	1b3e6da	for near switch auton, turned the ramp up off for the second straight leg of the drive straight section	3 days ago	
Keith Boruta	70b1a47	Changed the auton when both switch and scale are on the far side to go to the scale. Added a 10 second hold to TeleOp for the grabber arms (just in case at the start we are in the...	4 days ago	
Keith Boruta	1b0ca0e	Competition Code with Far Switch	5 days ago	
Keith Boruta	c81c21a	Auton tuning, turned of motor hold, misc tweaks for game bot	2018-02-20	
Keith Boruta	d391521	Added comment to be sure they are running the latest	2018-02-20	
Keith Boruta	c8c6370	Replaced all the holding functions for the elevator throughout with the holding function written for teleOp	2018-02-20	
Keith Boruta	380c2d4	Added a motor hold function. Added holding to all auton functions. Added expelling the cube to all auton paths at the end. Misc minor edits	2018-02-20	
Keith Boruta	ee15c7c	updated encoder software	2018-02-19	
Keith Boruta	9143228	Added prints in TeleOp for all encoders	2018-02-17	
Keith Boruta	19ed4d5	livonia code	2018-02-17	
Keith Boruta	9f47eac	Updated for 2018 robot. Added compressor and solenoids. Added ramp up time to the start of auton. Uses XBox controller (for now)	2018-02-17	
Keith Boruta	9b7687c	Refined Auton, added teleOp controls for elevator motor and left and right intake motors.	2018-02-13	
Keith Boruta	4a717e5	Modified the drive straight function to be able to move a secondary motor a specified distance if desired (but not required). Added a function to control a single motor with an enco...	2018-02-11	
Keith Boruta	3de46d1	Driving and rotation implemented for Auton in Center (drive forward only), Right and Left (either side switch or near side Scale)	2018-02-11	
Keith Boruta	dec0ffd	CHanges to the rotate with a correction factor (only works in one direction at this time)	2018-02-10	
Keith Boruta	d6dd3b9	Additional Changes (I forgot :()	2018-02-10	
Keith Boruta	5ea1e8b	added code to rotate robot in autonomous	2018-02-08	
Keith Boruta	cdc39b4	Added SmartDashboard controls. Made a function of the drive straight in auton function.	2018-02-07	
Keith Boruta	cfe9989	Updated Autonomous to drive straight using a Gyro. Updated formatting, drive system and other misc.	2018-02-03	

This was our first year switching from LabView to Java, a programming language which is easier to work with and more powerful. We made all of our code and updates available to other teams, and have been teaching our new students how to understand this new language.

Electrical

Motor Controllers: Spark Motor Controllers (PWM)
Power Distribution Panel
RoboRIO
Voltage Regulator Module
Rasberry Pi
Arduino Uno
CIM Motors
OpenMesh Radio
Removable Electronics Panel for Ease of Repair
RGB Lights on the Side of the Robot