

IEEE Southeast Con 2019 Team 305 Presentation

By: Chase Sapp, Kyle Voycheske, Yuan Chendong, Daniel Delgado, and Fabio Trinidad

Team Members



Chase Sapp

Team Leader/
Lead Electrical
Engineer



Kyle Voycheske

Lead Mechanical
Engineer



Chendong Yuan

Lead Control
System Engineer/
Financial Advisor



Daniel Delgado

Navigation
Specialist



Fabio Trinidad

Lead Software
Engineer

Daniel Delgado



Final Presentation Itinerary

Topic	Person
Southeast Con Synopsis	Daniel Delgado
Concept Selection and Generation	Chase Sapp
Hardware Design	Kyle Voycheske
Software Architecture	Fabio Trinidad
Budget	Yuan Chendong
Competition	Daniel Delgado

Daniel Delgado



Southeast Con 2019

- IEEE Region 3 for: Technical, Professional, and Student conference
- Focuses on sharing ECE latest information
- Events
 - A technical program with seminars, tutorials and workshops
 - A student program with student competitions
 - Exhibits
 - IEEE regional meetings
- Conference Location: Von Braun Center in Huntsville, Alabama
- Thursday, April 11th, 2019 through Sunday, April 14th, 2019



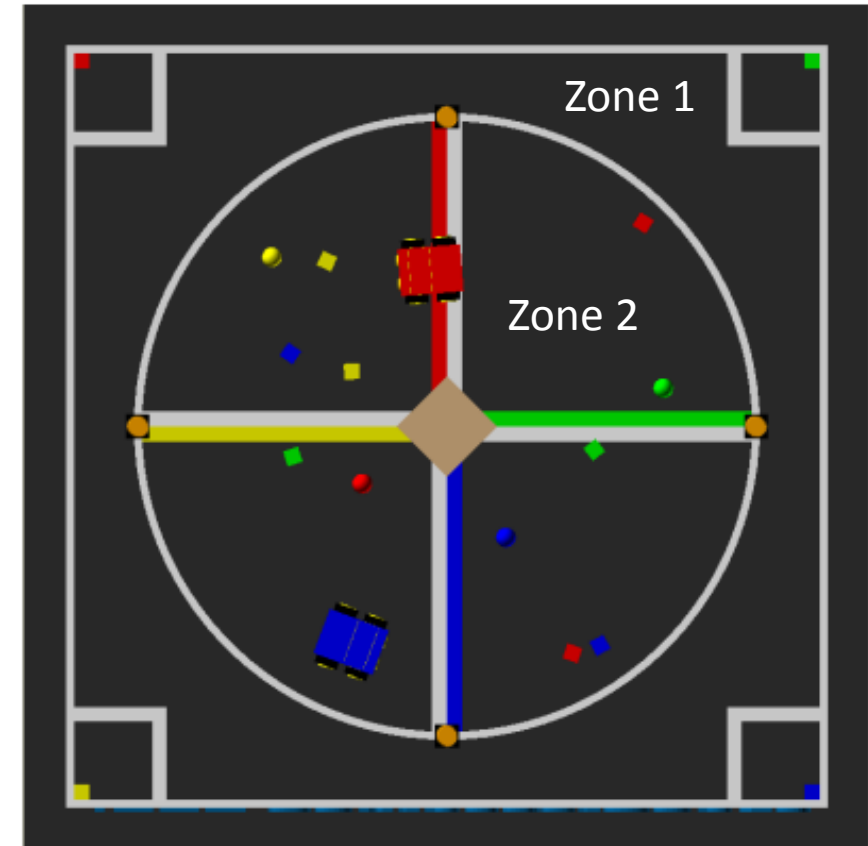
[2] Competition Location

Daniel Delgado

How to Earn Points in the Competition

Southeast Con 2019 Hardware competition Point System [1]

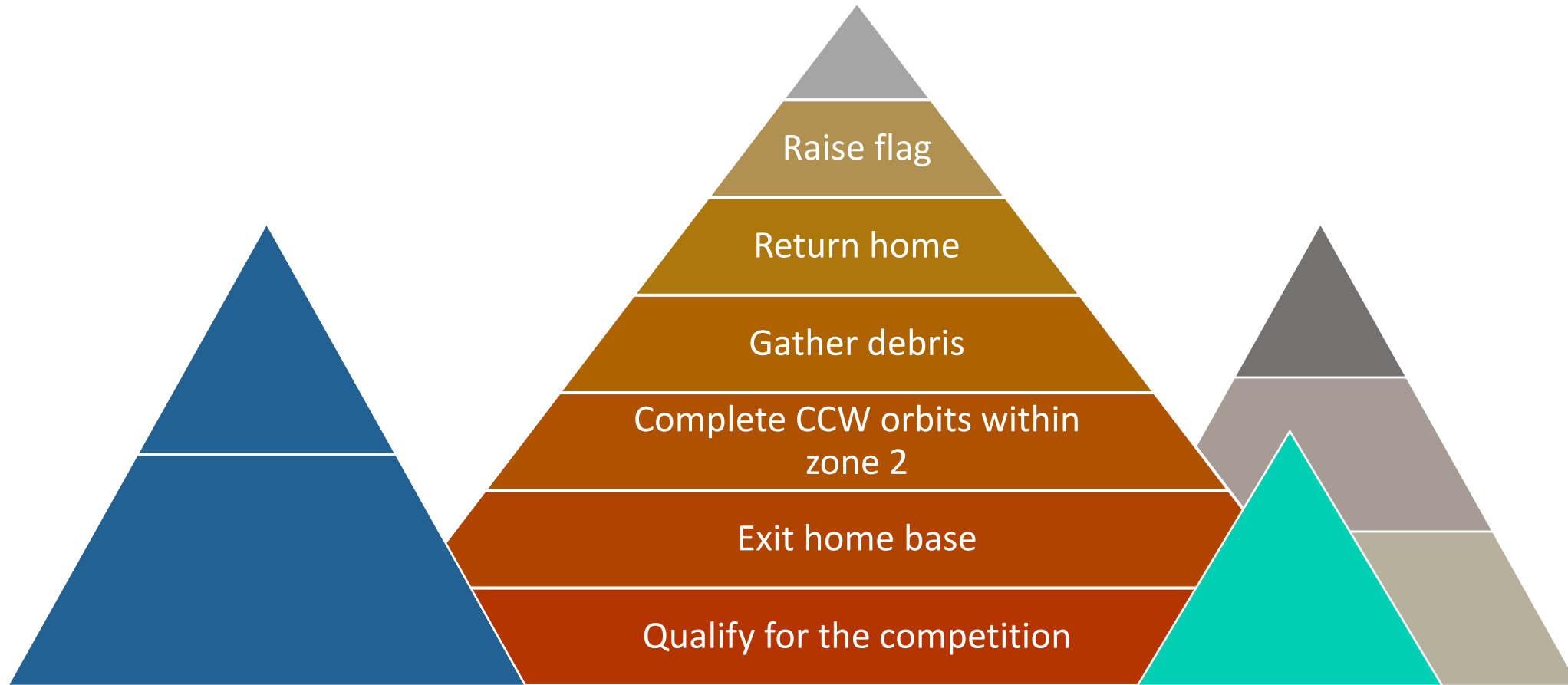
Points	Task
5 pts	Leave home base and enter Zone 1
5 pts	Cross the orbital line into Zone 2 (first time only)
5 pts	For each complete, counter-clockwise orbit within Zone 2, starting from the quadrant closest to designated corner square
10 pts	Debris removed from Zone 2 (each)
10 pts	Debris placed in corner square (additional to removal)
10 pts	Color-matched debris placed in appropriate color corner square (bonus points)
10 pts	Finish in your home base
25 pts	At conclusion of debris removal, raise your onboard flag while in home base
-10 pts	Every collision with a Spacetel



[1] Southeast Con 2019 Playing Field

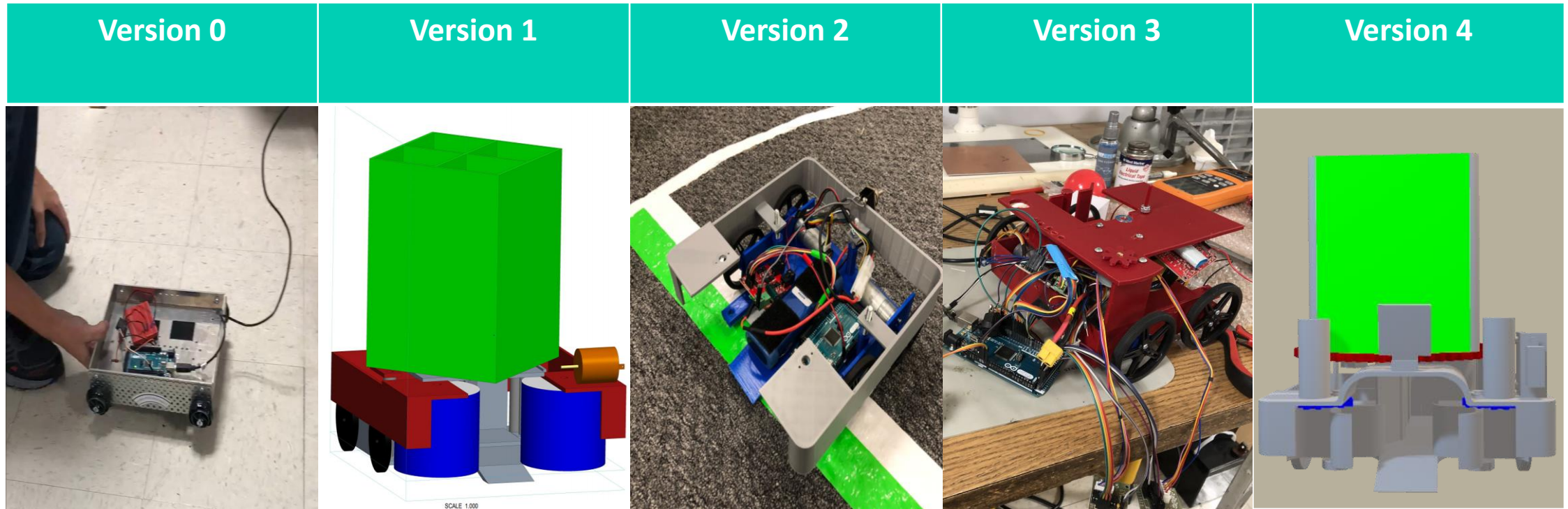
Daniel Delgado

The Design Objective



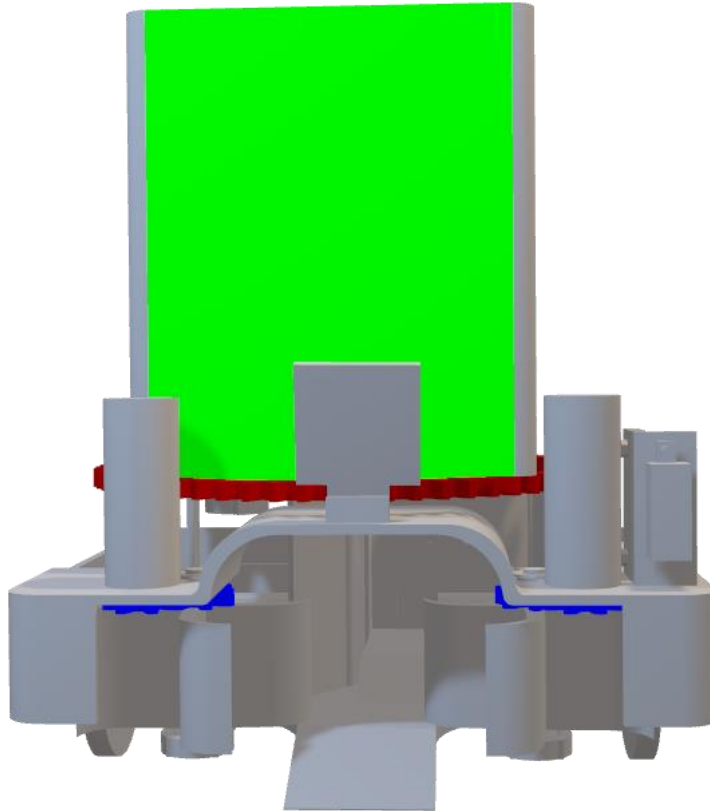
Daniel Delgado

Robot Versions to Now



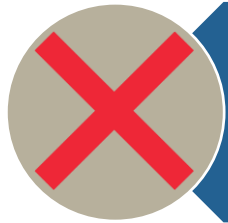
Chase Sapp

Concept Generation and Selection



Chase Sapp

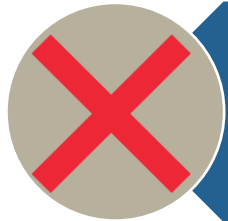
Gathering Debris



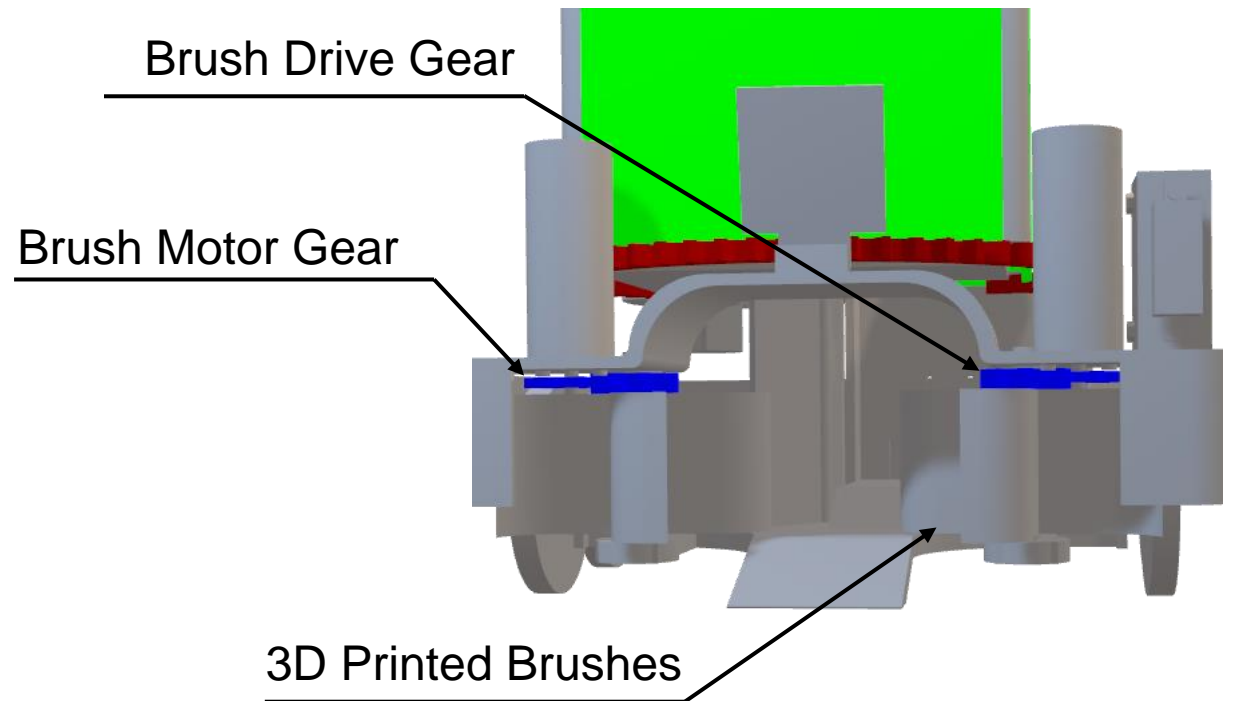
Don't Gather Debris



Dual Brush System



Extendable Arm



Chase Sapp

Sorting Solution

✓ Internal Elevator

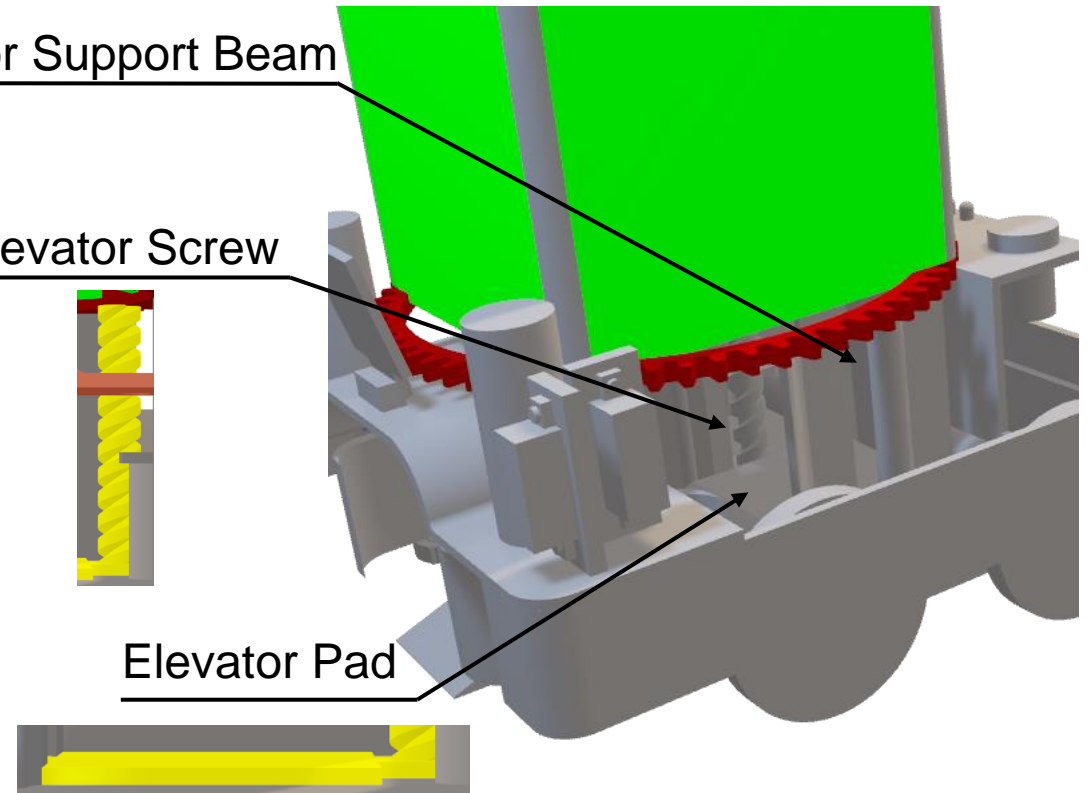
✗ Lane Driver

✗ Linear Memory

Elevator Support Beam

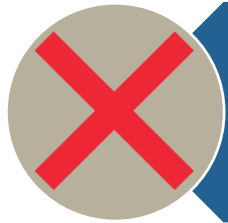
Elevator Screw

Elevator Pad

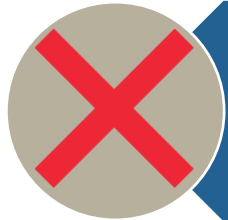


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Debris Storage



Simple Sack



Horizontal Lane System

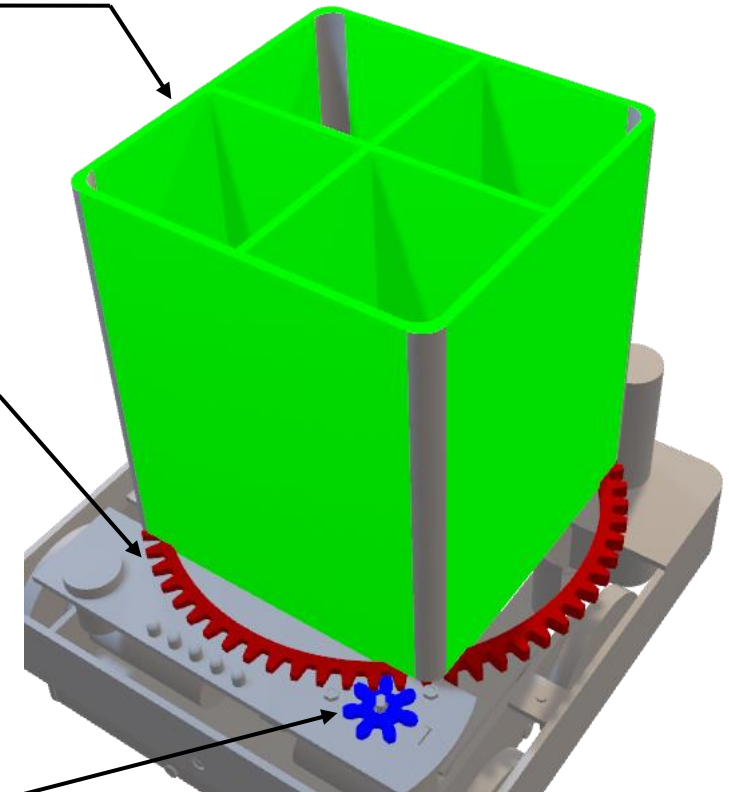


4-Chamber Sorting Box

4-Chamber Sorting Box

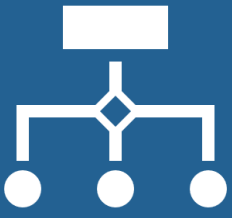
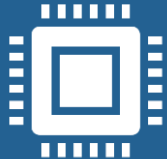

Sorting Box Gear

Box Motor Gear



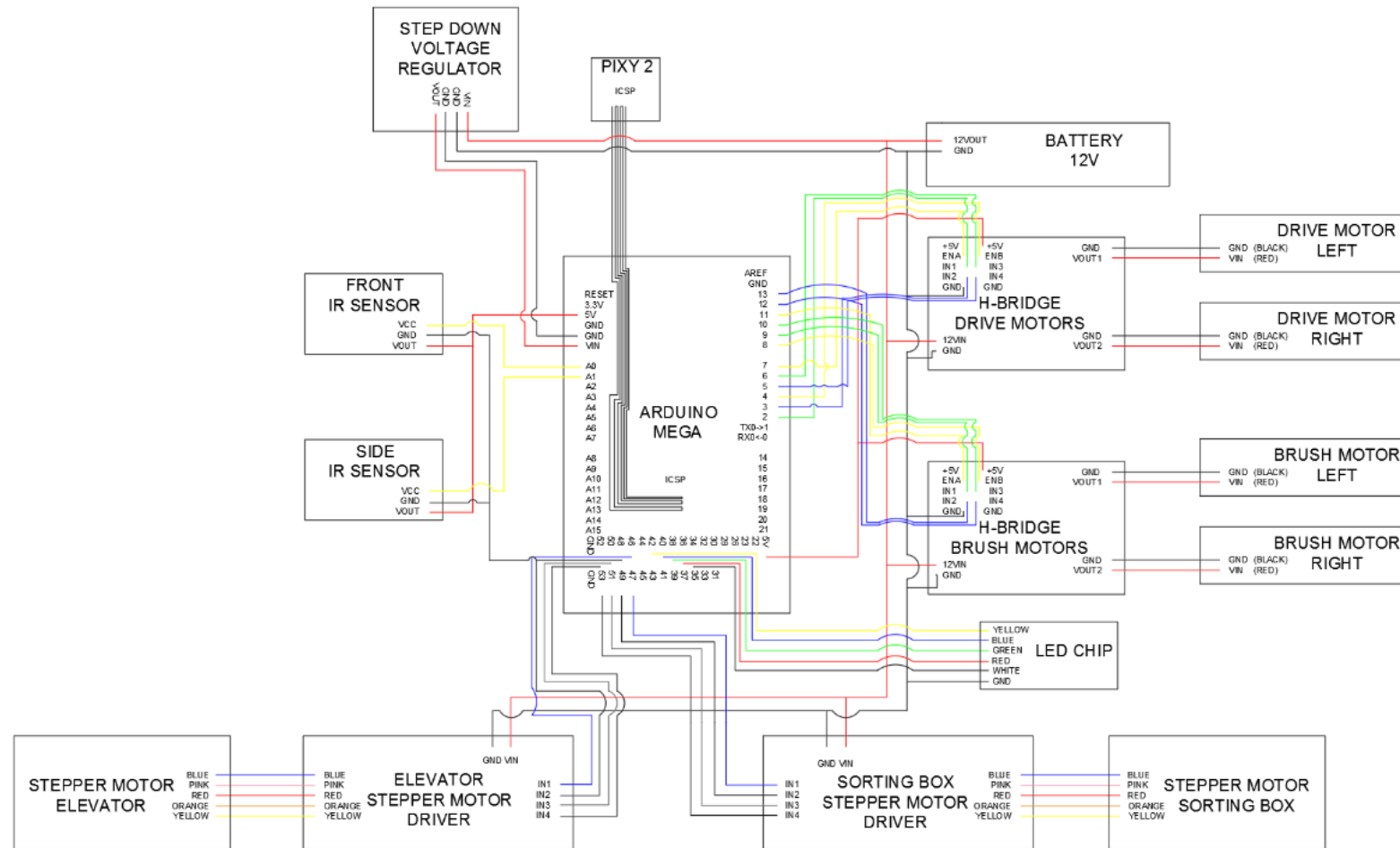
Chase Sapp

Concept Selection

				
	Controller	Battery	Wheels	Materials
Solution 1	Raspberry Pi	Lithium-Polymer	Omni Wheels	Aluminum
Solution 2	BeagleBone Blue	Lead-Acid	Tank Tread	PLA
Solution 3	Arduino Mega	Nickel-Metal Hydride	Airless Wheels	Plywood





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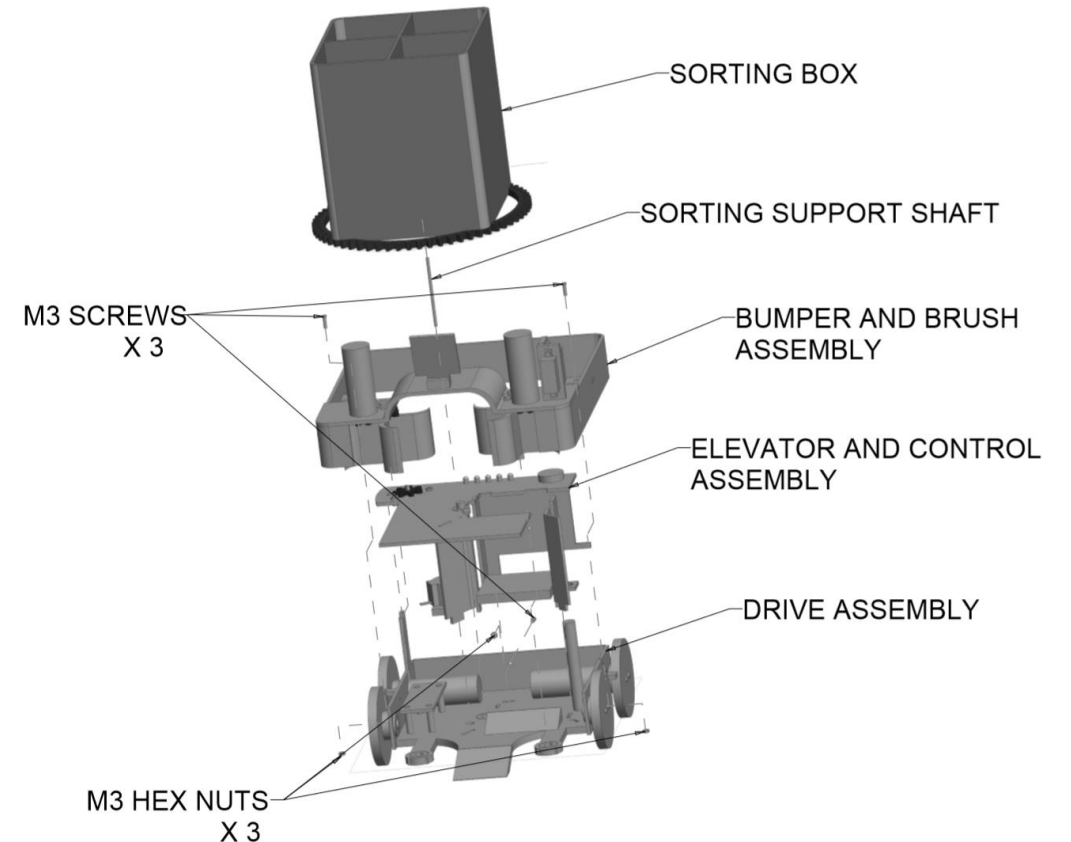
Wiring the Southeast Con Robot



Kyle Voycheske

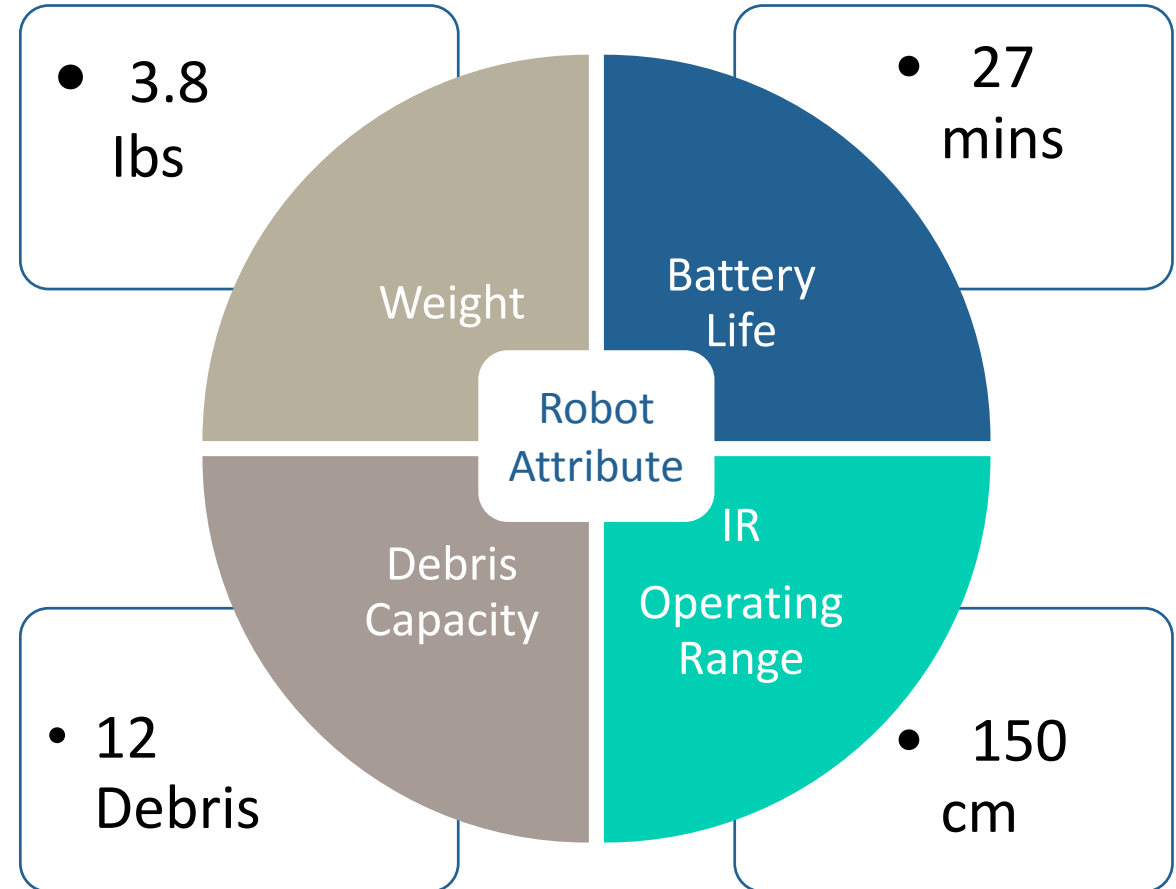
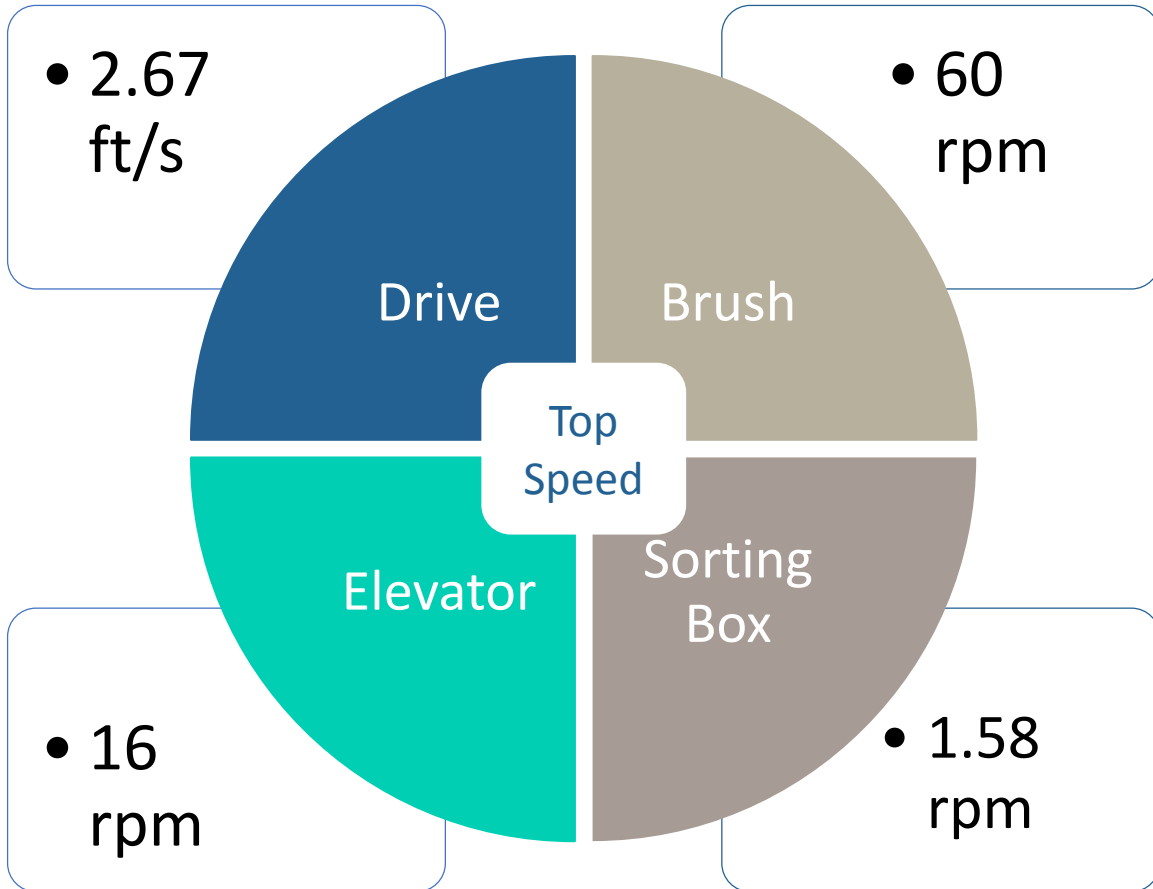
Overall Assembly

-  Four major sections
-  Total Parts: 105
-  Full assembly and test within a day
-  Supports up to 12 pieces of debris



Kyle Voycheske

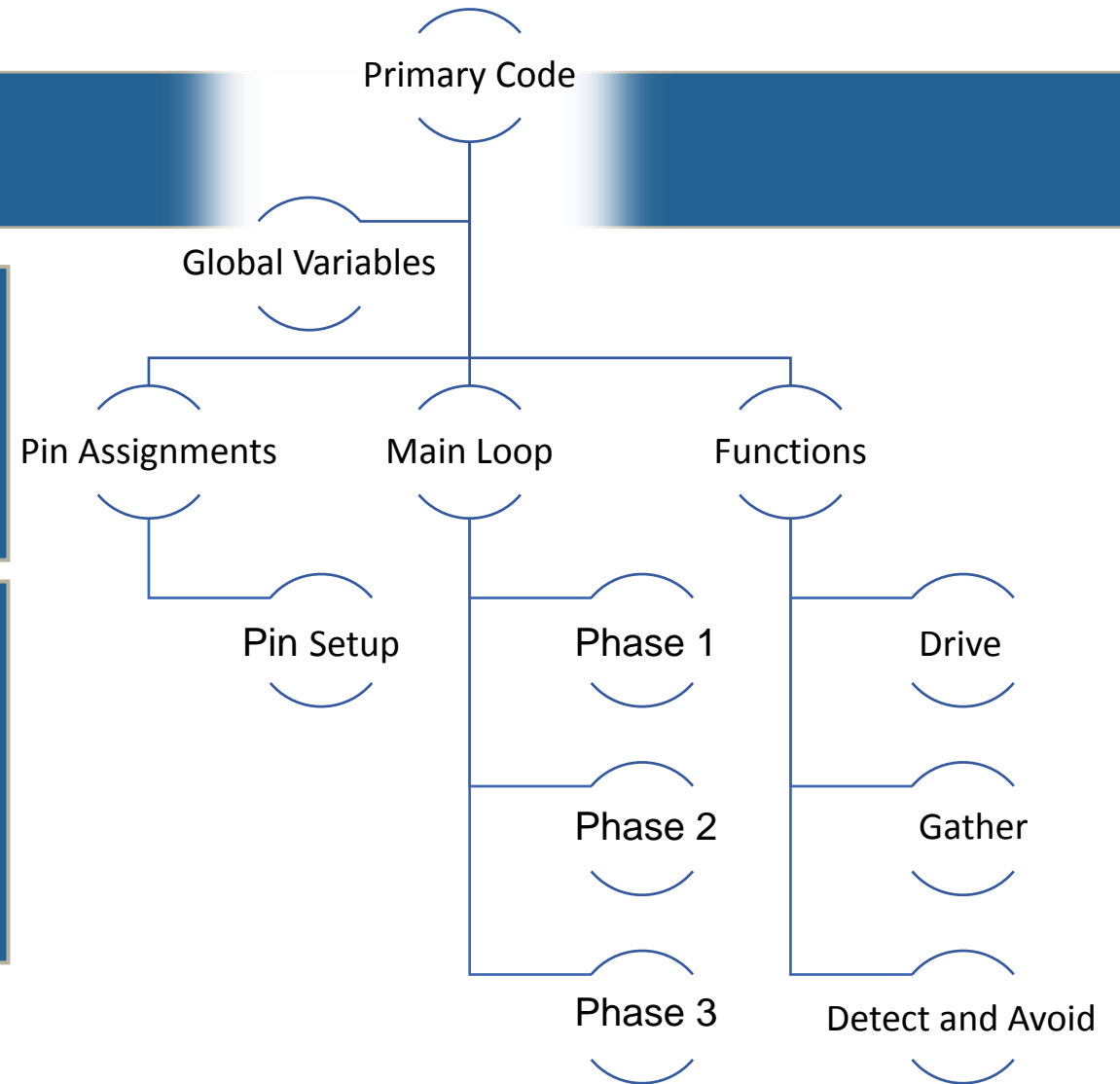
Robot Specs.



Kyle Voycheske

Organization

- Software divided into various modules to allow easy and quick debugging
- Included components: motor control, brush driver, sorting, and object detection



Fabio Trinidad

Software Phase Breakdown

1

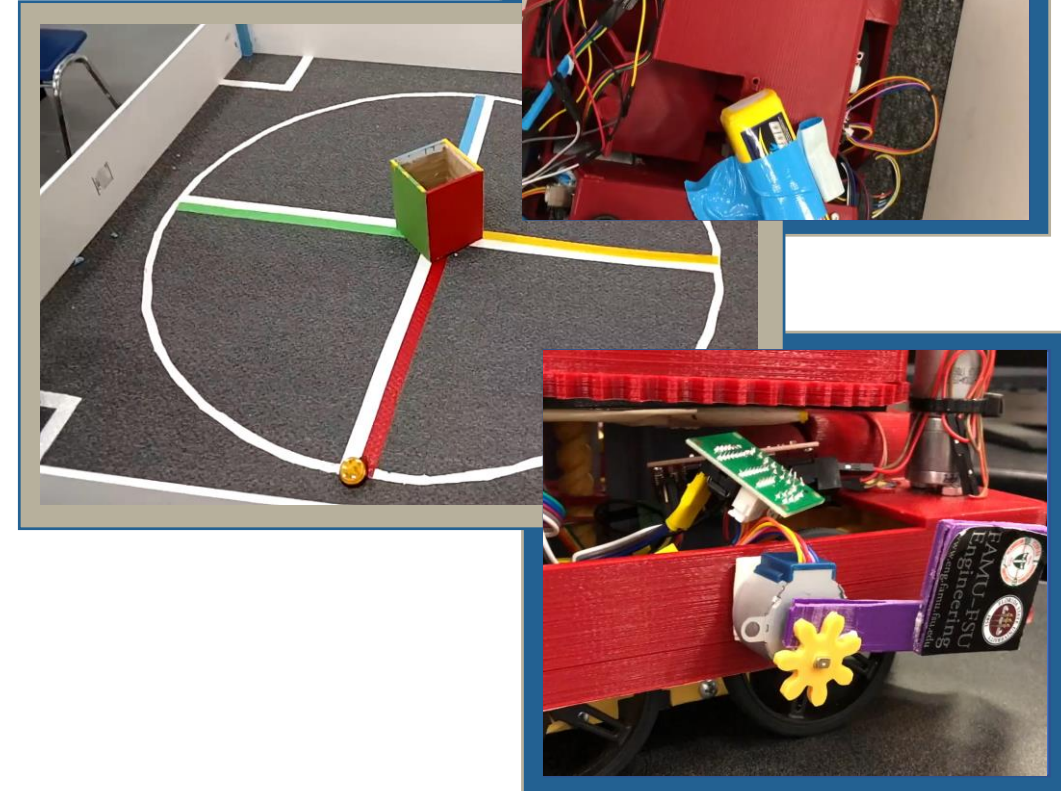
- Exit home corner
- Enter zone 2

2

- Gather debris
- Orbit counter-clockwise

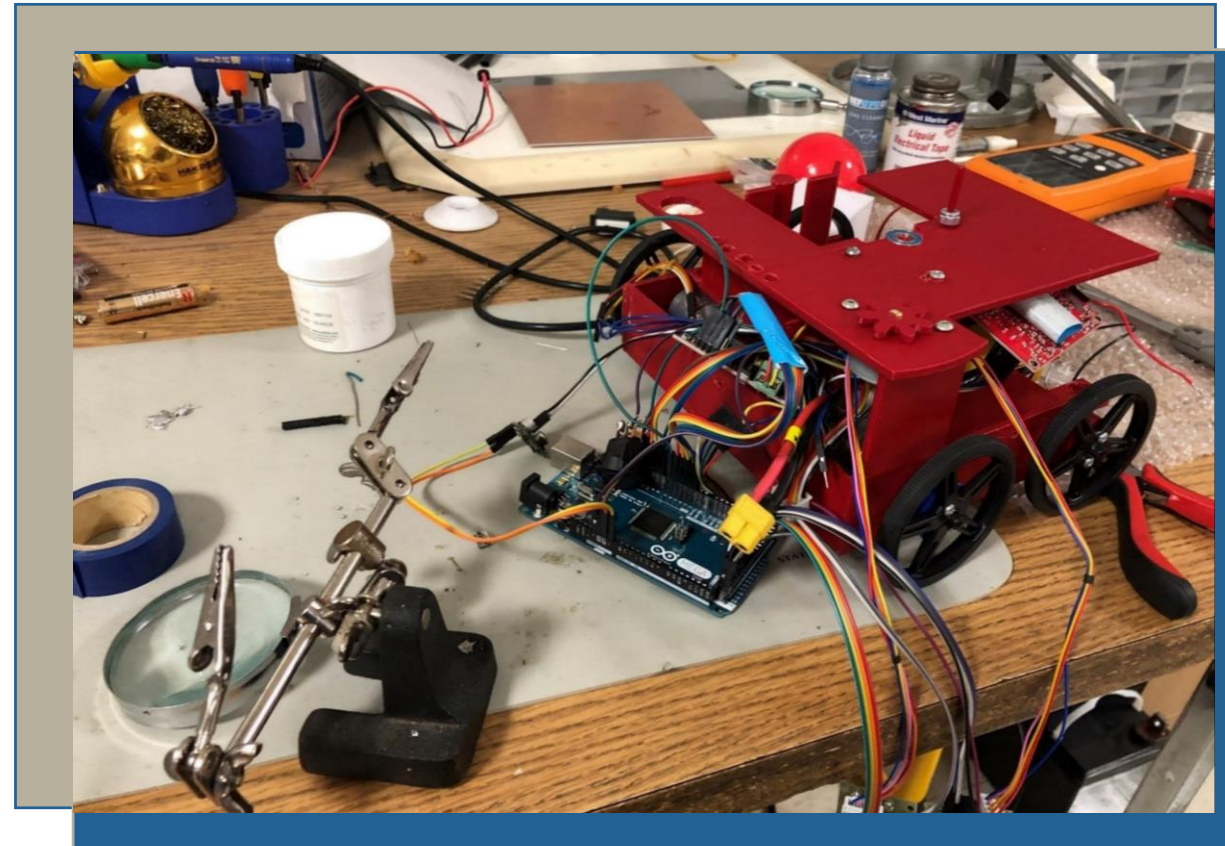
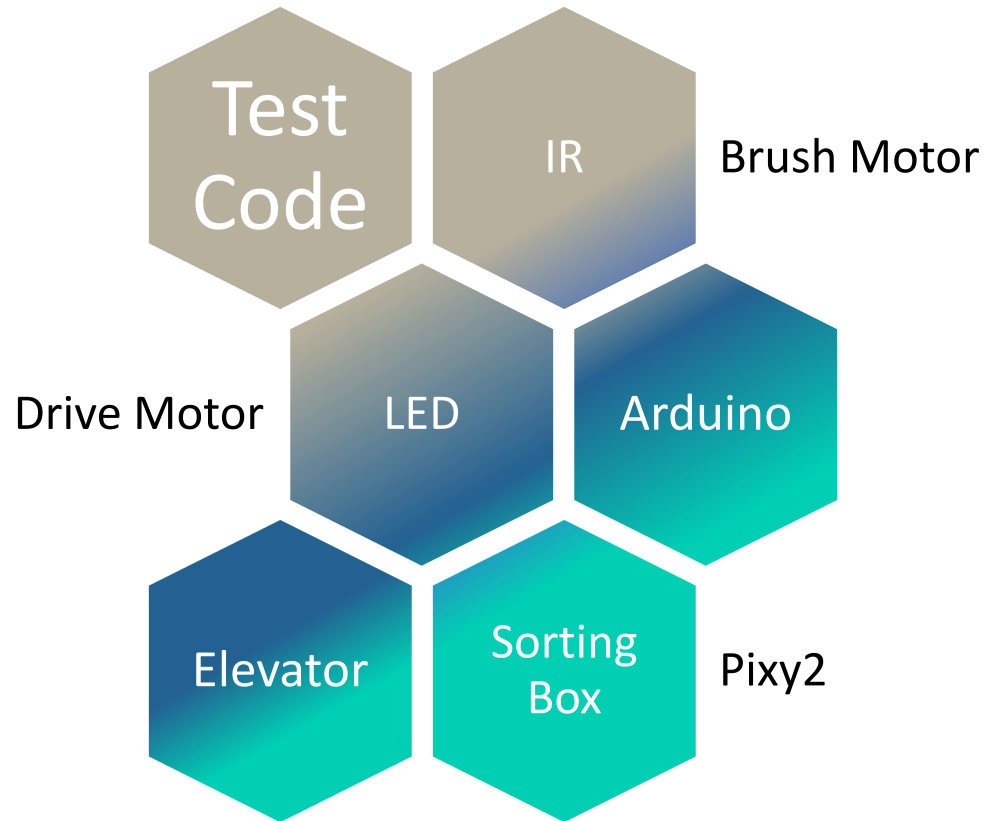
3

- Return home
- Raise flag



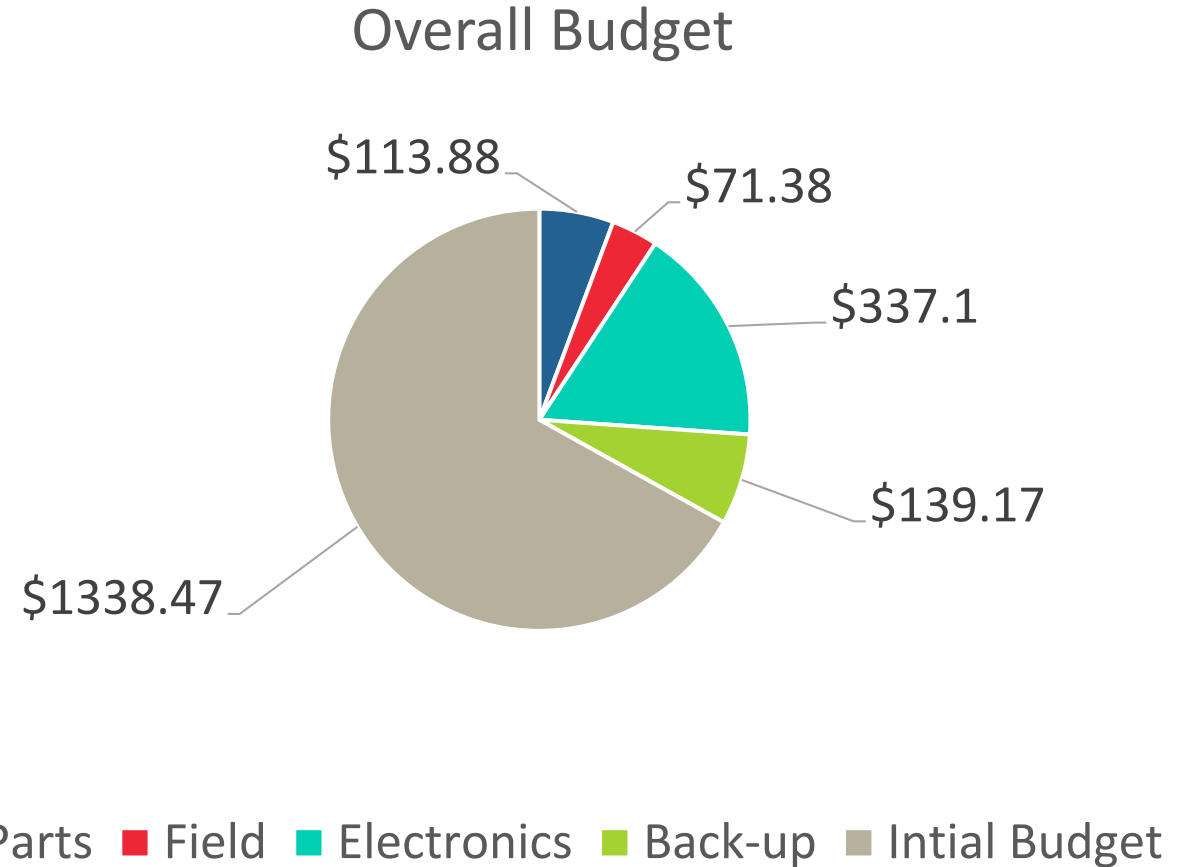
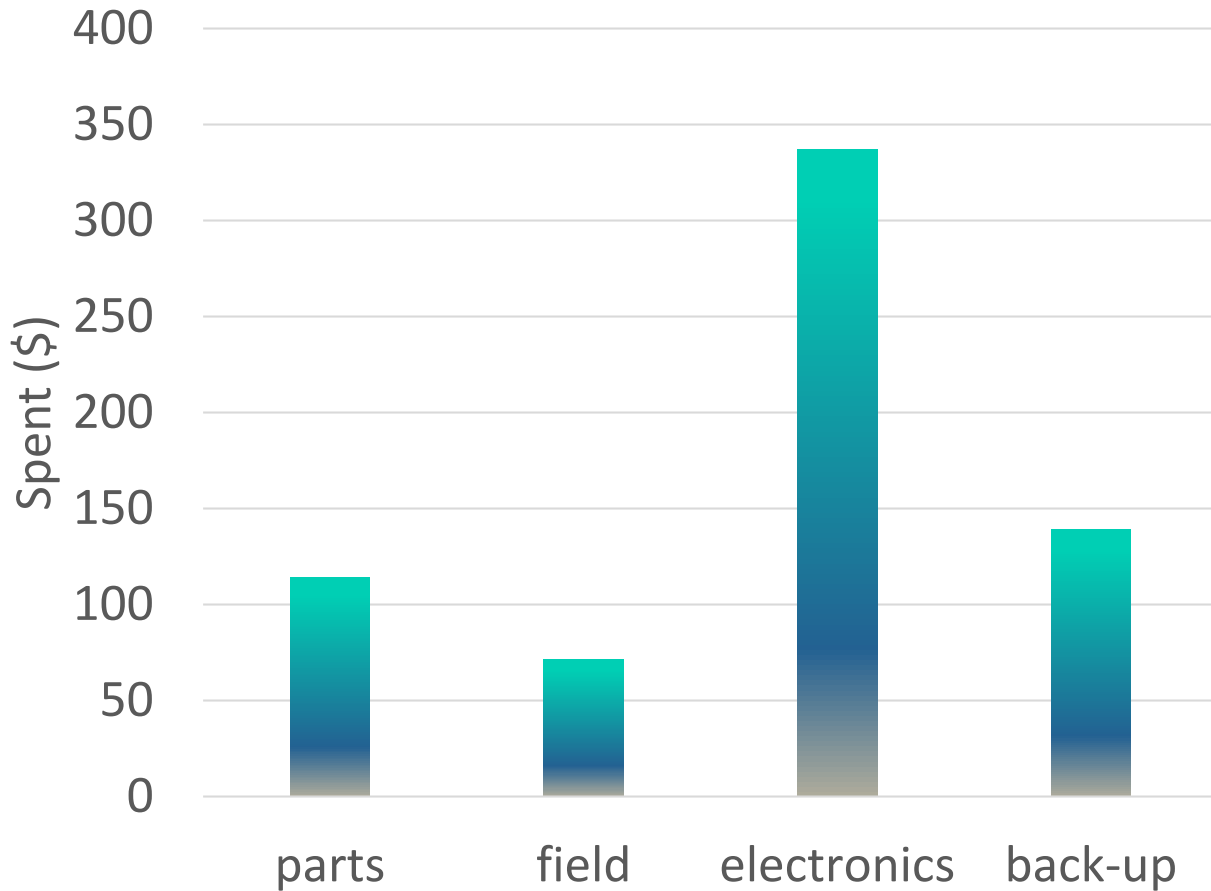
Fabio Trinidad

Test Codes



Fabio Trinidad

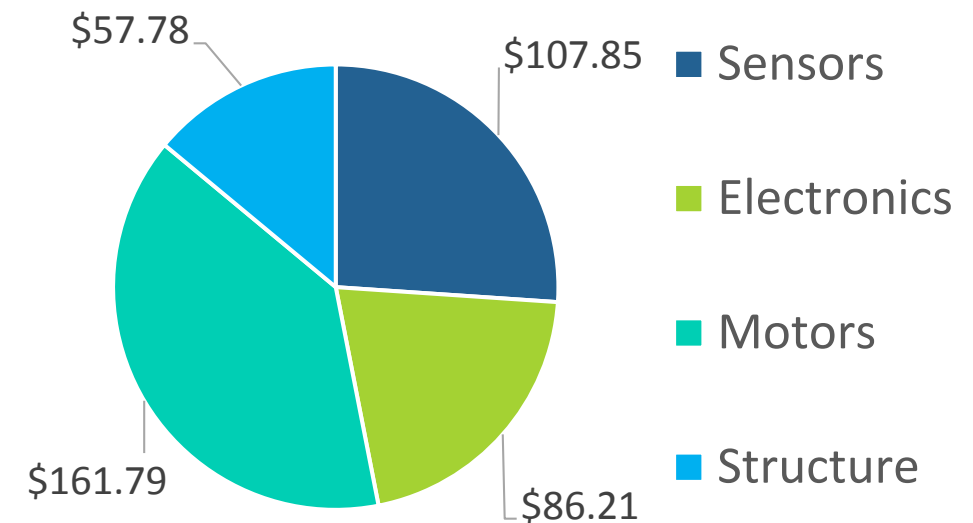
Budget Breakdown



Yuan Chendong

Material Bulk Bot Cost

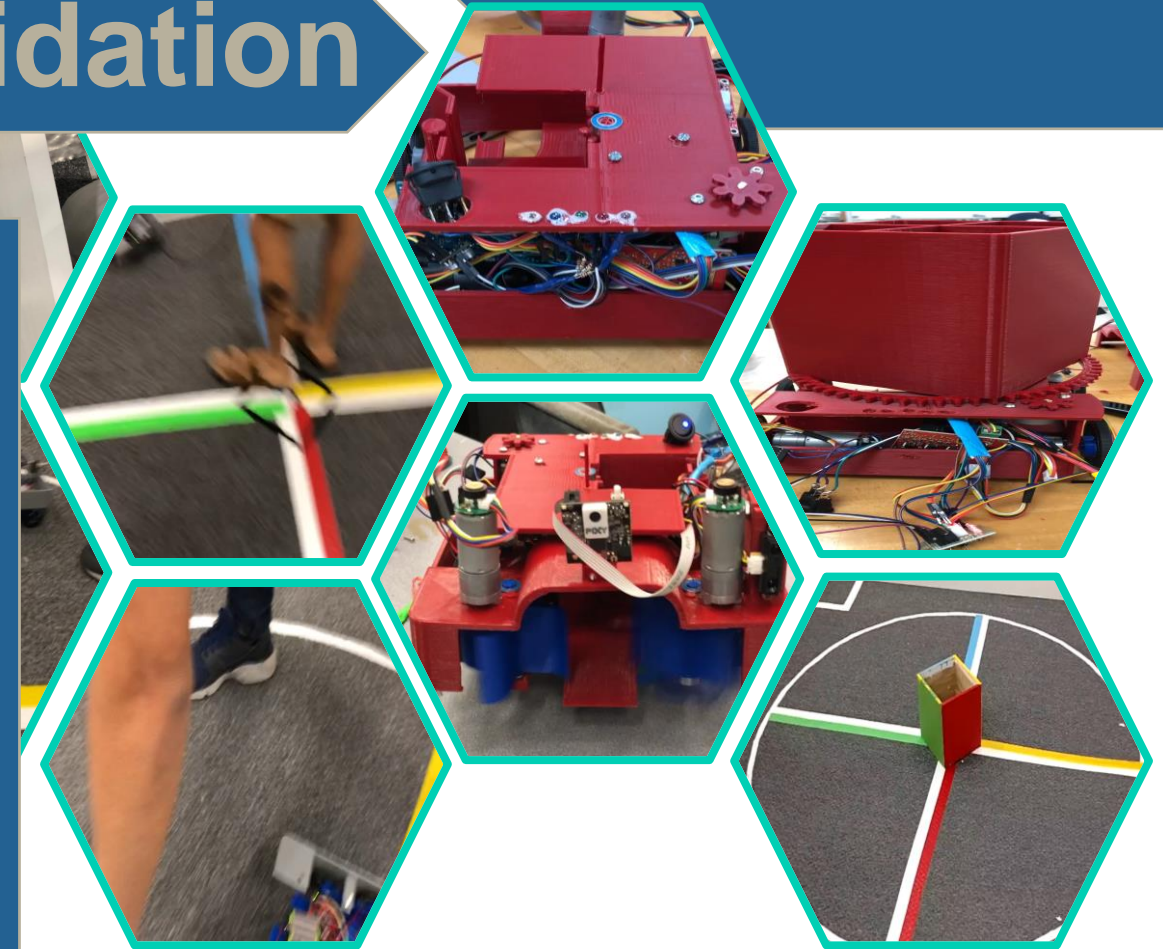
Sensors		Motors	
Pixy2	59.9	Gearmotor*2(wheel)	73.9
IR sensor*2	37.98	Stepper motor*2(sorting)	13.99
RGB sensor	9.97	Gearmotor*2(brush)	73.9
Total	107.85	Total	161.79
Electric parts		Structure	
Voltage regulator	11.95	Wheels	16.98
Switch	6.78	Bearings	10.48
H-bridge*2	33.98	Plastic sheets	29.27
Arduino board	33.5	Screw	1.05
Total	86.21	Total	57.78
Grand Total	\$413.63		



Yuan Chendong

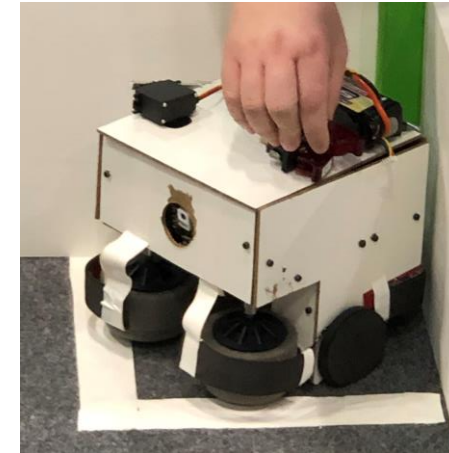
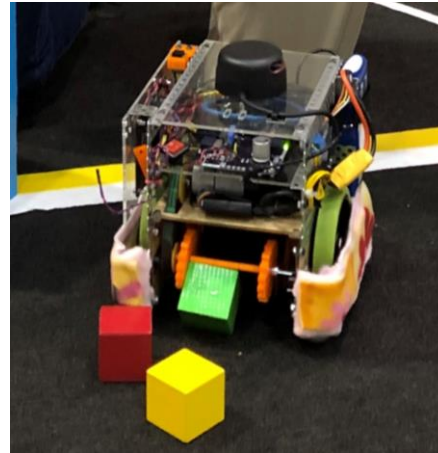
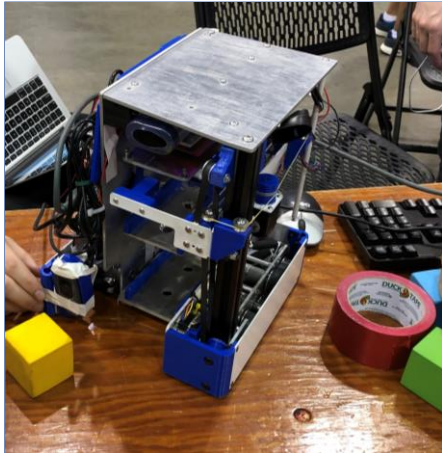
Competition and Validation

- Robot qualified
- Arduino board and battery failure
- Competed in the first two rounds
- Able to exit home, complete orbits, push debris, return home and raise on board flag
- Holds proper amount of debris
- Modular design



Daniel Delgado

Opposing Robots



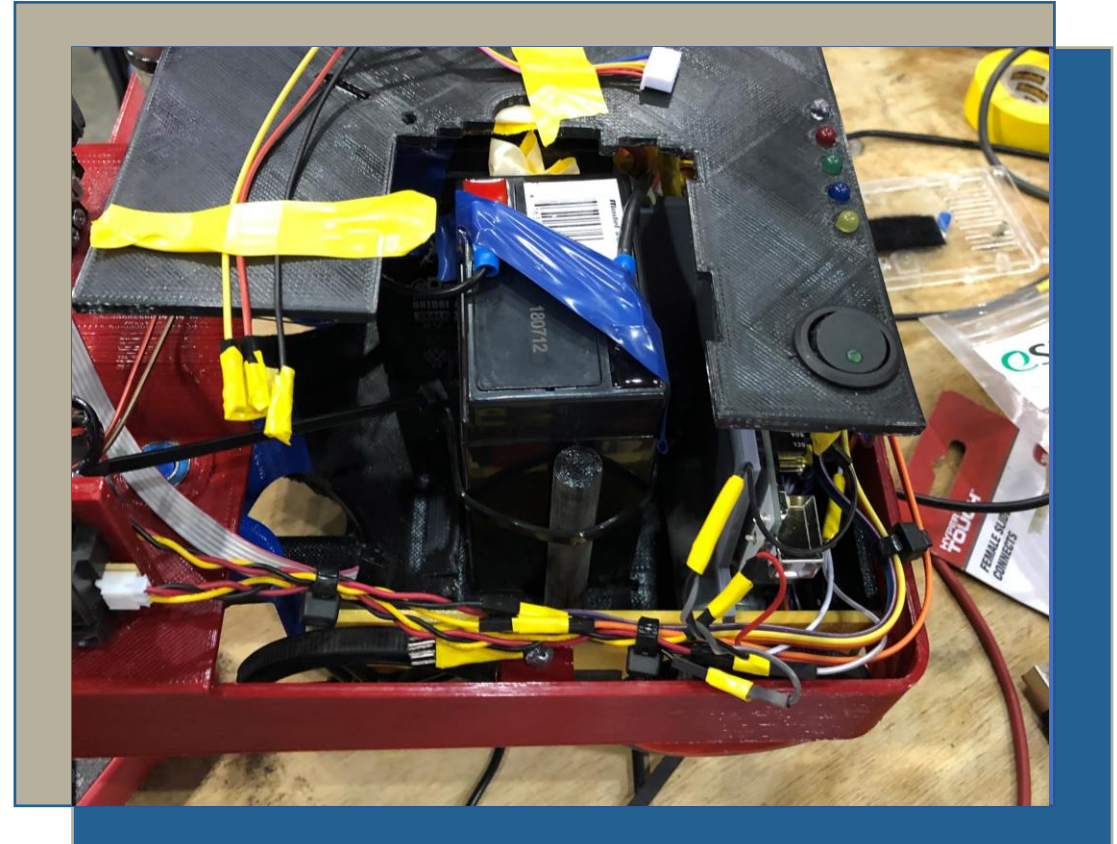
Daniel Delgado

Challenges on the way

Lesson Learned

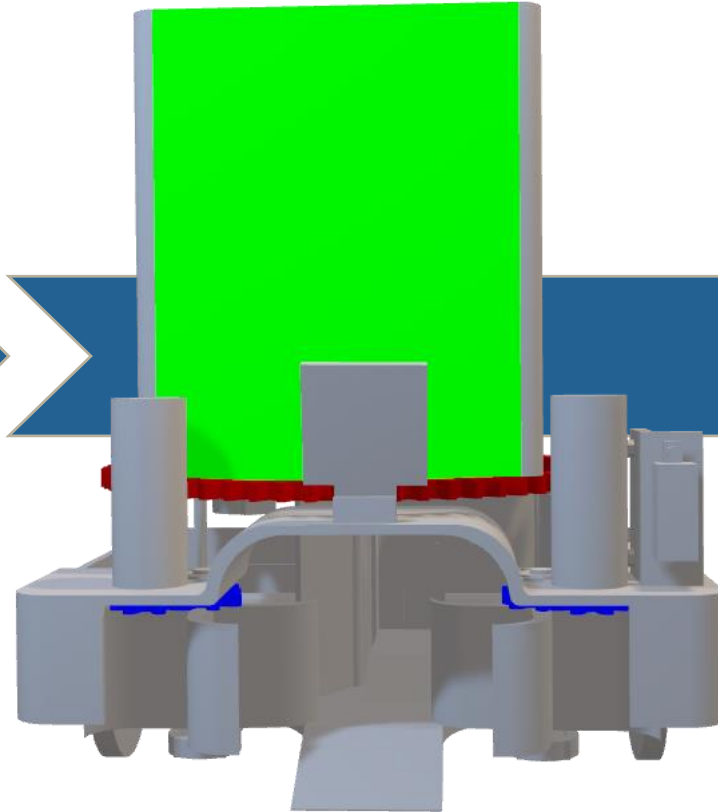
Don't challenge Murphy's Law

- When using old parts or equipment, check their level of operation.
- Program in parallel not in series



Chase Sapp

Questions?



Reference

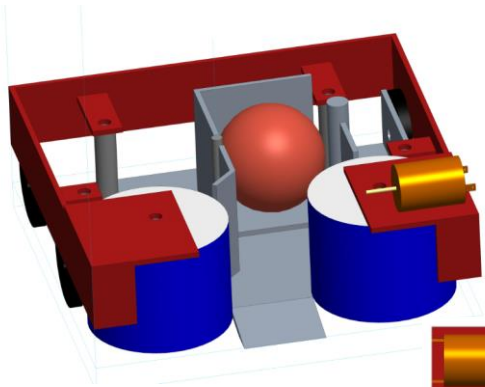
- [1] *IEEE Future Directions*,
sites.ieee.org/southeastcon2019/program/student-program/
- [2] “IEEE SoutheastCon 2019.” IEEE Future Directions,
sites.ieee.org/southeastcon2019/.

Backup Slides

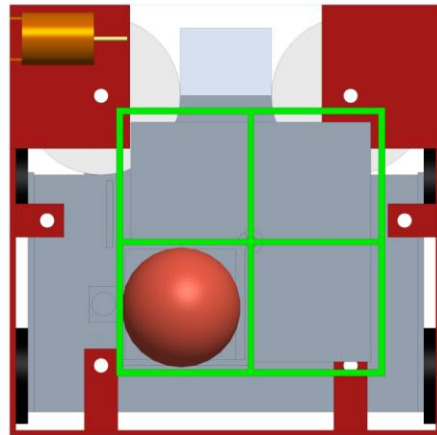


Sorting Hardware Method

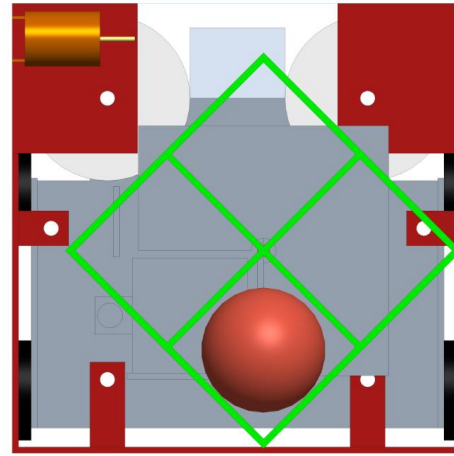
Step 1



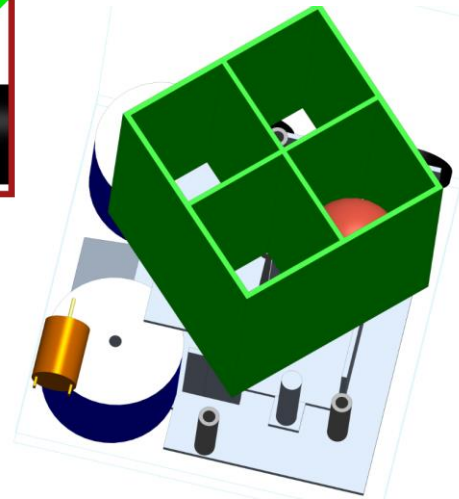
Step 2



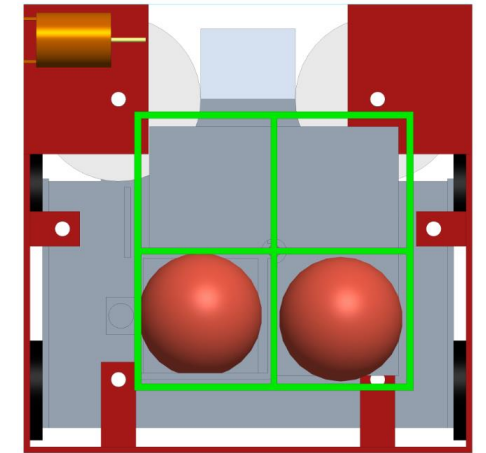
Step 3



Step 4



Step 5



Chase Sapp

Robot Showcase

Activate Brushes

Place hand in front of front IR sensor to activate the brushes.

Activate Elevator

Place hand in front of side IR sensor to activate the elevator.

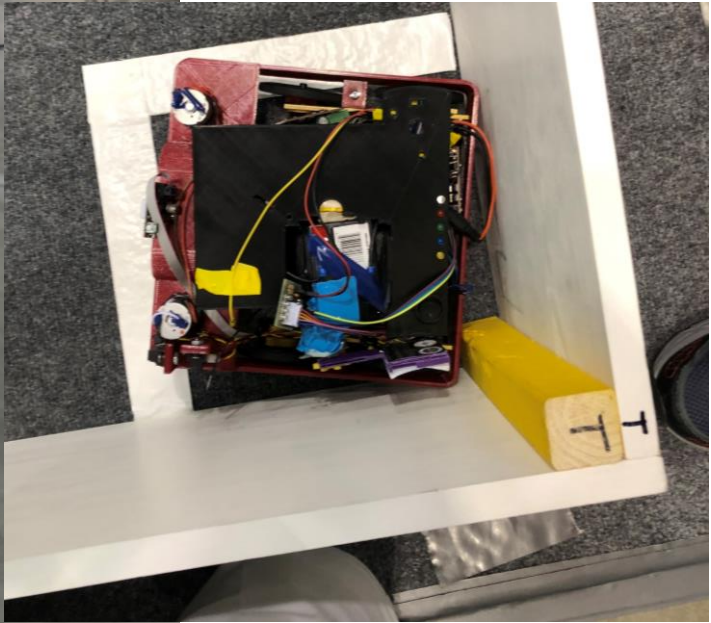
Daniel Delgado

Specially Designed Parts

A mixture of CAD and 3D printing to design specific parts for the robot:

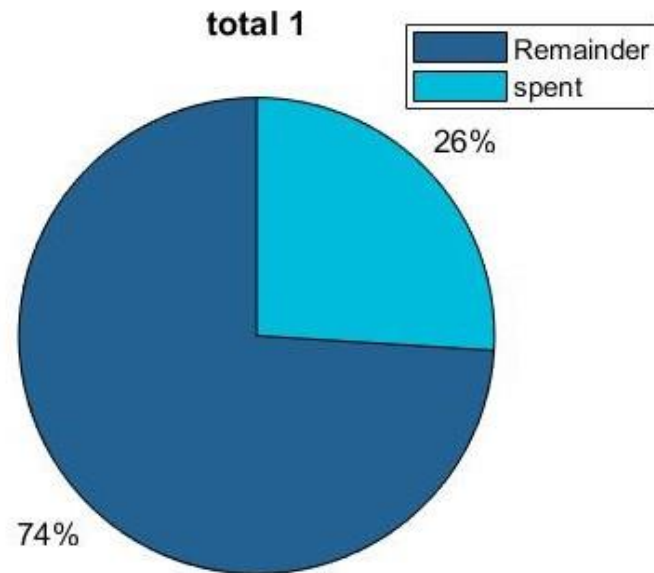
Small Design Parts				
Wheel Hubs	Gears	Elevator	Sorting Box Pin	Brushes

Kyle Voycheske

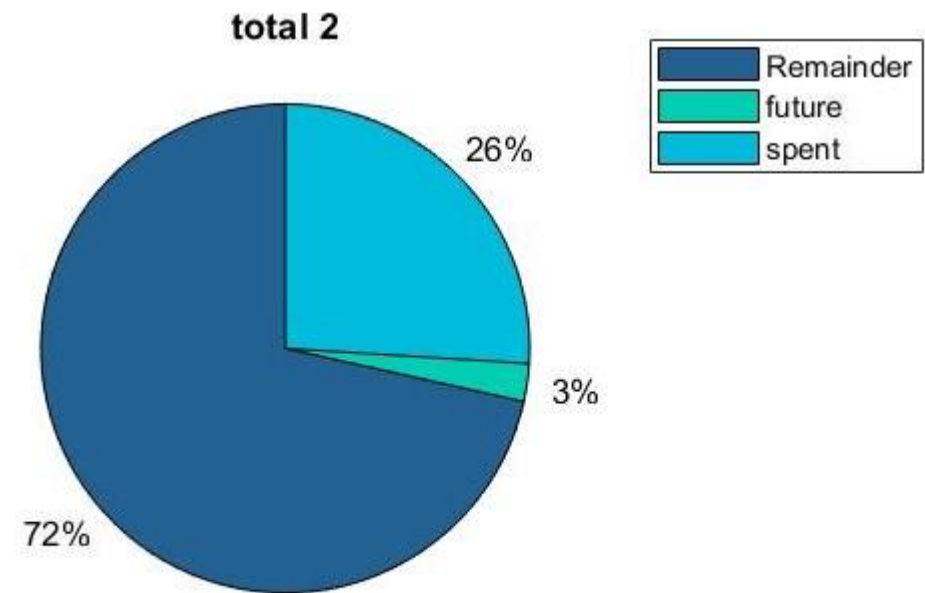


Budget Update

Before VDR 7



Estimate VDR 7



Yuan Chendong