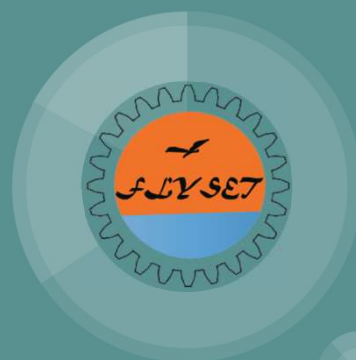


2018 FLYSET FTC Workshop - 2-Wheel Direct Drive

(9/3/2018)



Melody Hu

This is my 7th year in a FIRST program. I was in FLL jr. for 2 years, and I was in FLL for 3 years. This upcoming season will be my 2nd year in FTC. Last season, I was a builder team, Quantum X.

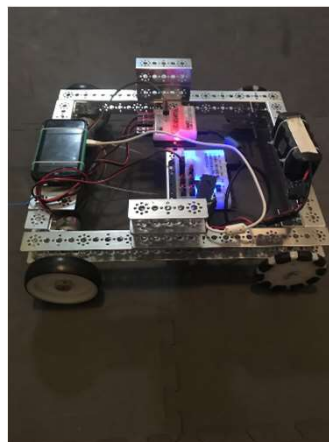
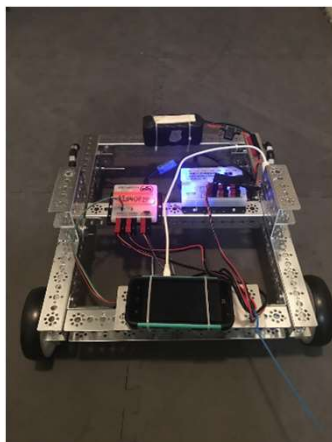


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Chassis Specification

2-Wheel Direct Drive



Bare Chassis Weight: 8.5 lb

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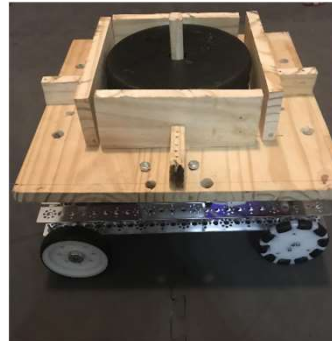
2-Wheel Direct Drive



13.5 pounds



28.5 pounds



43.5 pounds



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2-Wheel Direct Drive

- Tetrix Chassis
- Two AndyMark 40 motors
- 2 four inch wheels and 2 four inch omni wheels
- Base chassis weight (including the weight support tray): 13.5 lbs
- A tray on top to contain the weights during the load tests

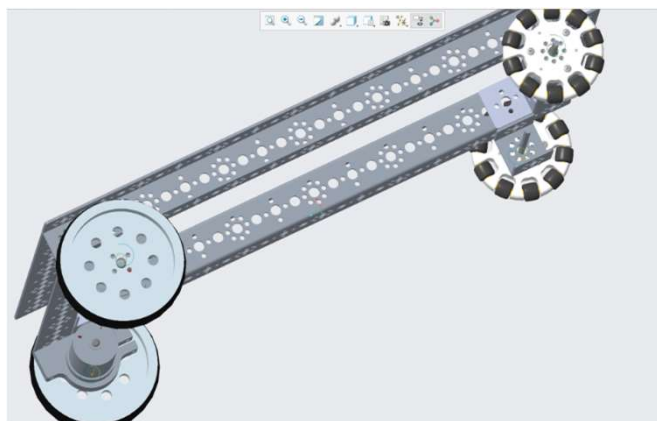


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Chassis CAD Design

2-Wheel Direct Drive in Design Phase



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2-Wheel Direct Drive CAD Notes

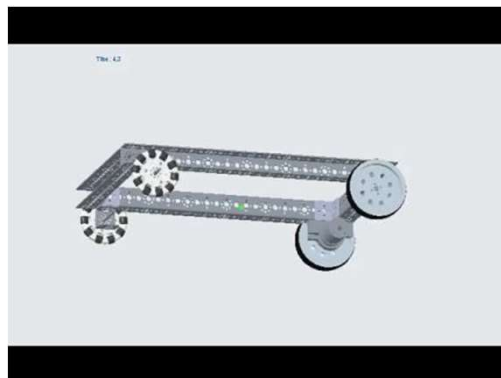
- I did default constraints on the wheels which was a problem when simulating, so I changed them all to pin constraints



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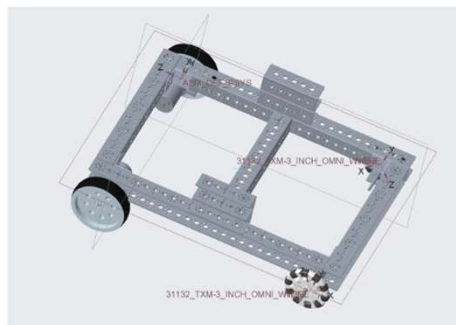
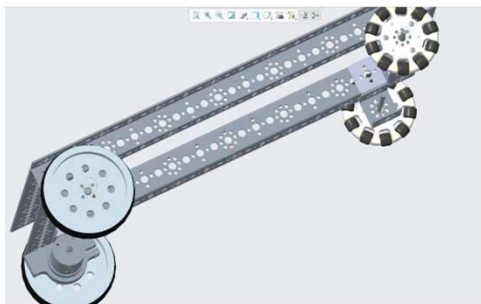


2-Wheel Direct Drive CAD Model Simulation



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2 Wheel Drive CAD Model Comparison



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Chassis Test Results





2-Wheel Direct Drive Build Notes

- I added two mini channels to my chassis, so I could put the wooden tray on for testing with weight.



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Test 1: Forward Speed Test

- The chassis went slower as I added more load

	No load	15 lb load	30 lb load
Distance traveled	4.49 m	4.29 m	4.06 m



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Test 2: Three Second Turn Test

- The chassis turned less as more load was added

	No load	15 lb load	30 lb load
Degree turned	274	162	112



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Test 3: Driving up/down a ramp

- Without load, my chassis could go on every time
- With load, the chassis could only get on 1 out of 3 times
- During this test my chassis disconnected and fell off the ramp causing the chassis to be slightly deformed at the bottom

	No load	15 lb load	30 lb load
Up ramp	yes	no	no
Down ramp	yes	no	no



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Test 4: Balance Stone Balancing Ability

- My chassis could never get on the stone because only the front wheels are connected to motors

	No load	15 lb load	30 lb load
Go on the stone?	no	no	no
How long on the stone? (forever is settled on the stone)	N/A	N/A	N/A



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Test 5: Pull Strength Test

- The chassis could only pull 10 pounds with 15 pound load and 30 pound load

	No load	15 lb load	30 lb load
10 lb pull weight	N/A	5.08 seconds	5.35 seconds
20 lb pull weight	N/A	N/A	N/A
30 lb pull weight	N/A	N/A	N/A



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Test 6: Autonomous Straight Line Drift Test (Optional)

- The other chassis got less drift when more load was added while mine drifted more and more because my wheels started bending outwards
- This was because of the ramp test where my chassis fell off the ramp
- Before recording the data, this chassis actually drifted probably less than 2 inches



	No load	15 lb load	30 lb load
Horizontal drift	7 cm	12 cm	15 cm



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2-Wheel Direct Drive Summary

- The chassis can actually go pretty straight
- It is hard for the chassis to get onto the balancing stone because there are only 2 motors
- The chassis is not very good at pulling



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Direct Drive

Pros:

- Accelerates very quickly to get to the top speed
- Easy assembly
- Precise
- Instantly stops
- Lighter weight
- Less components
- No chain tensioners to worry about

Cons:

- Puts a lot of load on the motors
- Hard to adjust speeds if you don't know exact drive ratio you want
- Locked into putting your transmissions at the 4 corners of the robot





Geared/Chained Drive

Pros:

- Very resilient to shock loading
- Very reliable when done right

Cons:

- Can take up large volumes within the robot
- Can be unreliable if not done right
- Can be heavy

