

2019 FLYSET FTC Workshop

V-Frame 8 Wheel Chassis

(8/24/2019)





Presenters



Austin Liu - FTC 8565

- 9th year in FIRST
 - 3 years in Jr. FLL
 - 3 years in FLL
 - 2 years in FTC
- Main Builder with Programming and CAD experience
- Enjoys Tennis and Video Games





Audrey He - FTC 8565

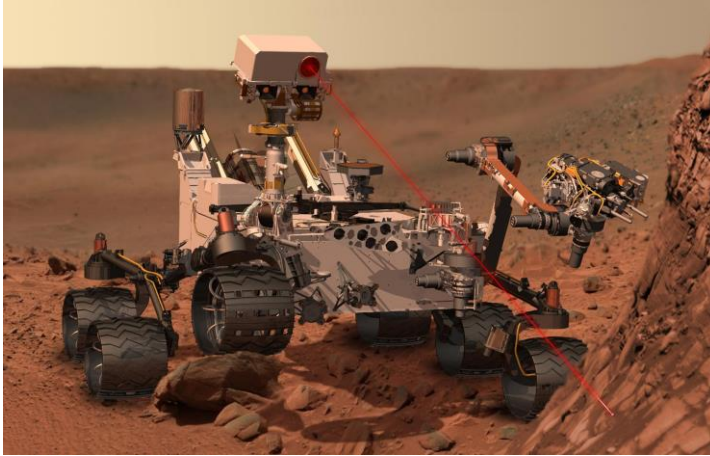
- 9th year in FIRST
 - 3 years in Jr. FLL
 - 3 years in FLL
 - 2 years in FTC
- Builder and notebook manager on the team
- Enjoys art and dance





Project Background

V-Frame 8 Wheel Chassis





Chassis Design

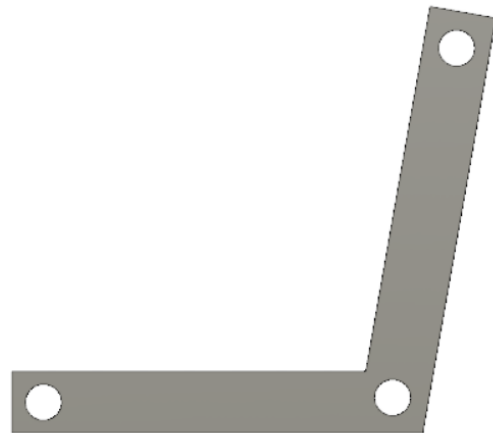
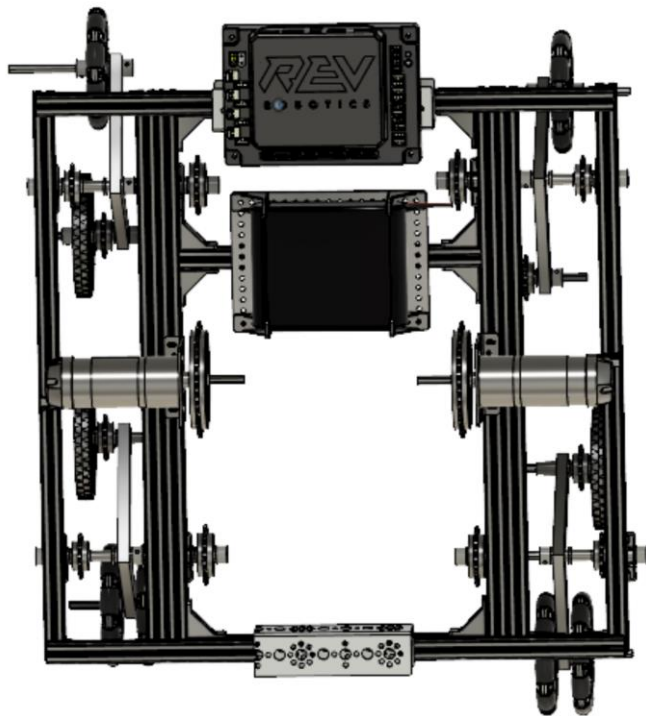


Goals

- Build a similar chassis that can cross the crater efficiently
- Compare the chassis with other chassis in normal driving
 - Going straight
 - Turning
- Evaluate the chassis in crossing crater



Design



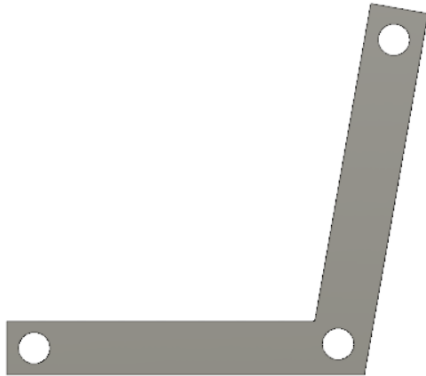


Chassis Build



Build Decision

For easy adjustment, I chose to 3D print my parts for fast prototyping.





V - Wheel Hole Sizing

- Problem
 - Holes vary based on the 3D printer
 - Axles wobbled in place
- Solution
 - Make it considerably smaller and adjust by filing



V - Wheel Length Requirements

- Problem
 - Length was in between chain link size
- Solution
 - Adjust hole distance in the model to the perfect chain size



V - Wheel Strength

- Problem
 - V - Wheel breaks under pressure
- Solution
 - Slowly increase the infill of the V - Wheel
 - 20%
 - 30%
 - 50%
 - 70%





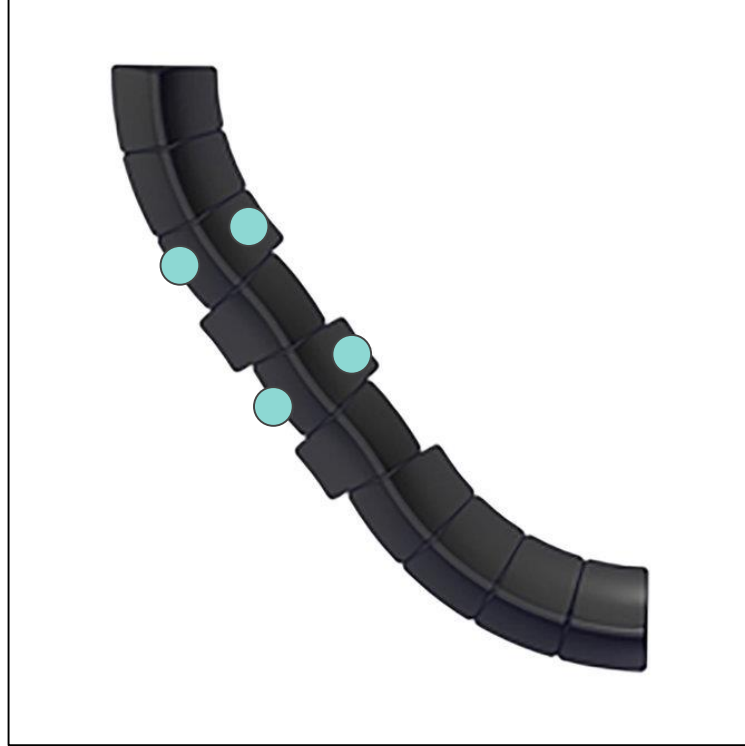
V - Wheel Pair Spacing

- Problem
 - Inner drive wheels weren't sync
 - Front frame was already over before back frame came into contact with the crater
- Solution
 - Find the best distance between the inner wheels





V - Wheel Pair Spacing



V - Wheel Rotational Limit

- Problem
 - V-Frame rotates too much
 - Affects the crossing efficiency
- Solution
 - Custom printed block part





Project Results



Forward Speed Test Spec

- Drive forward for 5 seconds at full power (100%) (Sensitive to voltage)
- Measure distance traveled in meters





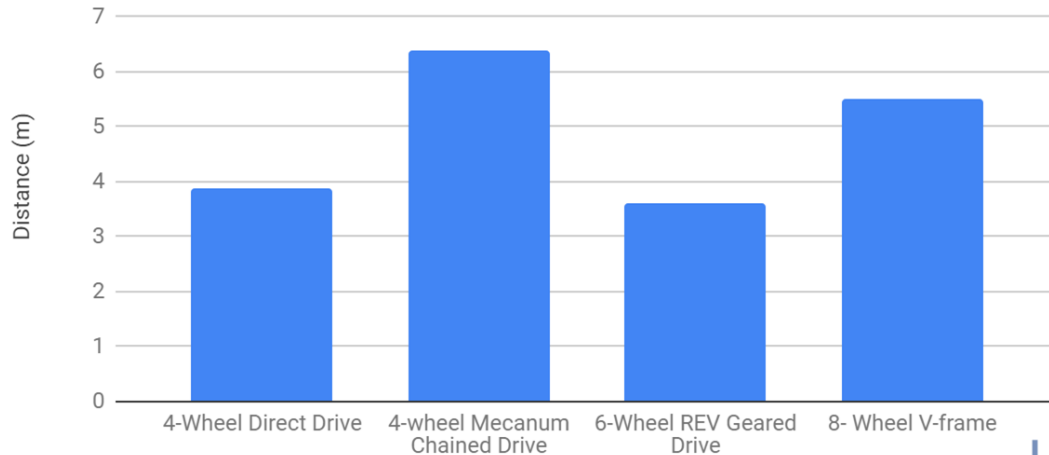
Forward Speed Test Code

```
// Run the robot forward for 5000 ms
while (runtime.milliseconds() < 5000 && opModeIsActive()) {
    // robot.leftFrontMotor.setPower(1);
    robot.leftBackMotor.setPower(0.97);
    // robot.rightFrontMotor.setPower(1);
    robot.rightBackMotor.setPower(1);
}
// Stop the robot
robot.stopRobot();
```



Forward Speed Test Results

	4-Wheel Direct Drive	4-wheel Mecanum Chained Drive	6-Wheel REV Geared Drive	8- Wheel V-frame REV
No load	3.87m	6.38m	3.60m	5.50m





3 Second Turn Test Spec

- Turn for 3 seconds at full power (one side 100% power forward, other side 100% power backward) (Sensitive to voltage)
- Record: can it turn freely? (Yes) Does it get stuck? (No)
- If it can turn freely, record how far it turned in degrees using IMU sensor
- Rotate more than 1 rotation, so need to add 360 degrees to the reading on the driver station which stays on the phone for 6 seconds after robot stops





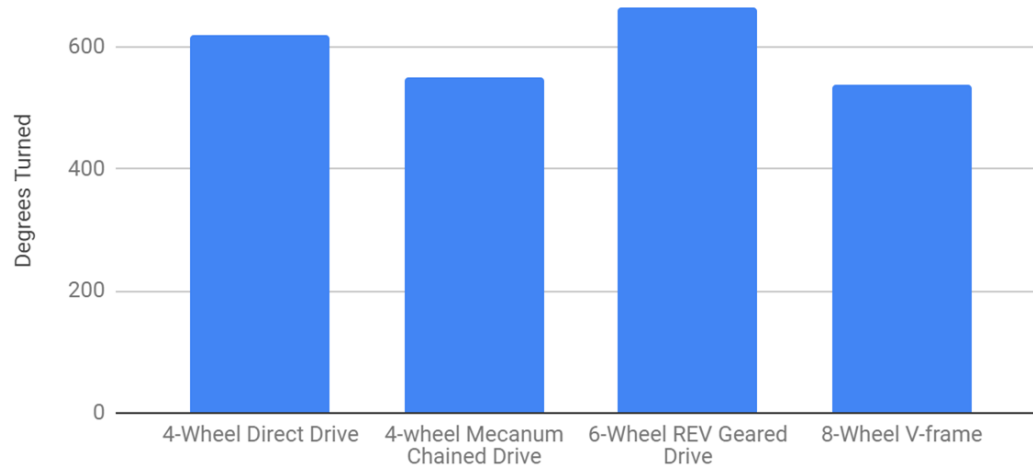
3 Second Turn Test Code

```
waitForStart();  
runtime.reset();// Turn the robot for 3000 ms  
while (runtime.milliseconds() < 3000 && opModeIsActive()) {  
    // robot.leftFrontMotor.setPower(-1);  
    robot.leftBackMotor.setPower(-1);  
    // robot.rightFrontMotor.setPower(1);  
    robot.rightBackMotor.setPower(1);  
}
```



3 Second Turn Test Results

	4-Wheel Direct Drive	4-wheel Mecanum Chained Drive	6-Wheel REV Geared Drive	8-Wheel V-frame REV
No load	618°	551°	664°	536°





Crater Crossing Test Spec

- Robot will start at one side of the crater
- Drive forward for 3 seconds at full power
- Check log on phone to see Gyro Sensor reading
- Record every other value





Crater Crossing Test Code

```
robot.leftBackMotor.setPower(0.9);  
robot.rightBackMotor.setPower(1);  
runtime.reset();  
while (opModeIsActive() && (runtime.seconds() < 3.0)) {  
    Log.i( tag: "angle:", msg: ""+getHeading());  
    if(Math.abs(getHeading()) > memes) memes = Math.abs(getHeading());  
    telemetry.addData( caption: "Highest Angle: ", memes);  
    telemetry.update();  
}
```



Crater Crossing Test Video





Crater Crossing Test Comparison

- Not completed yet because the chassis has not been tuned to go through the crater entirely





Conclusions



Next Steps

- Thicken the V-Frames and finalize hole distance
- Raise the motors up higher on the chassis
- Two points of connection on the blockers





Questions?