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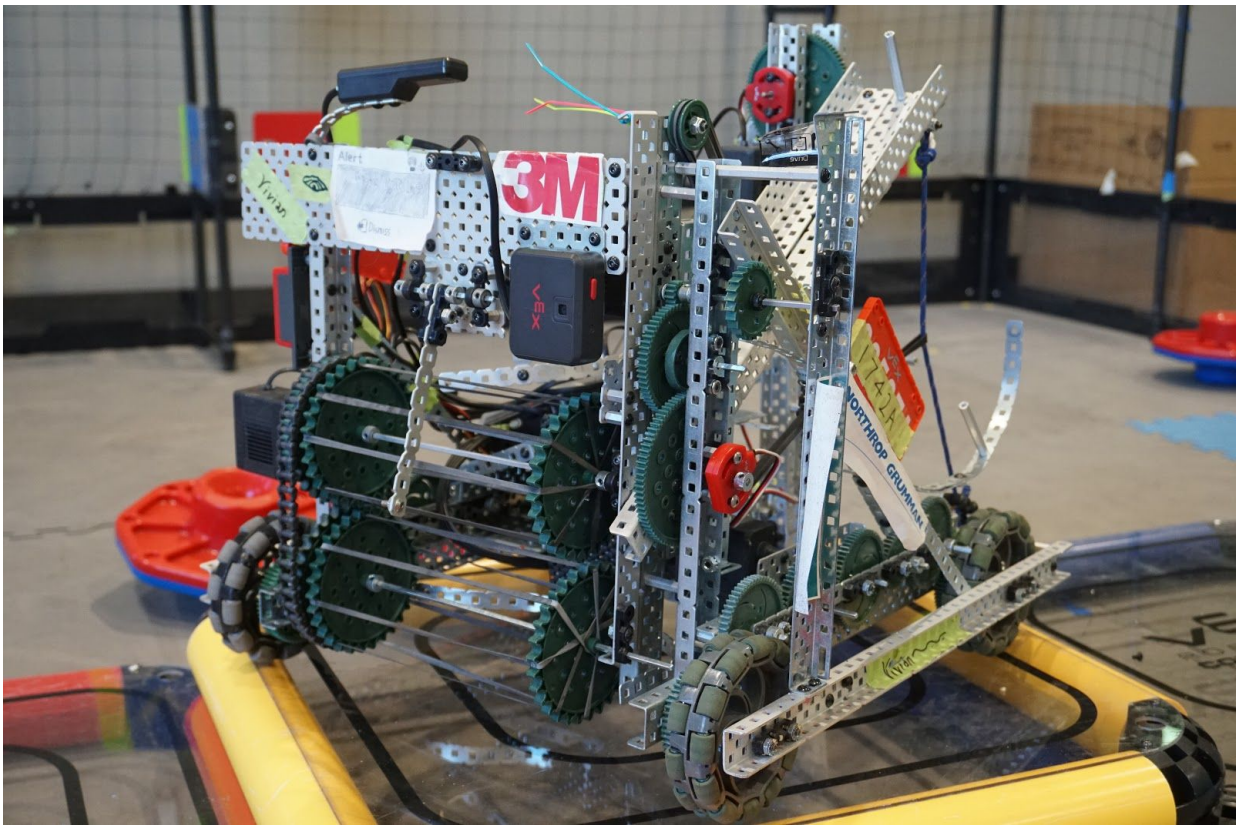
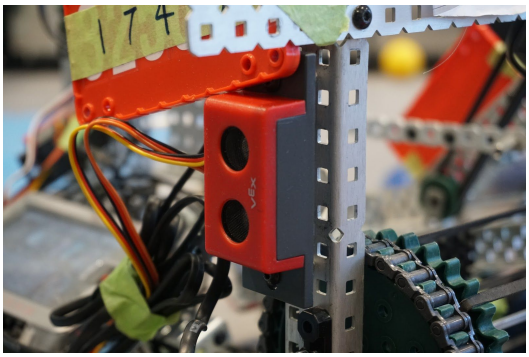
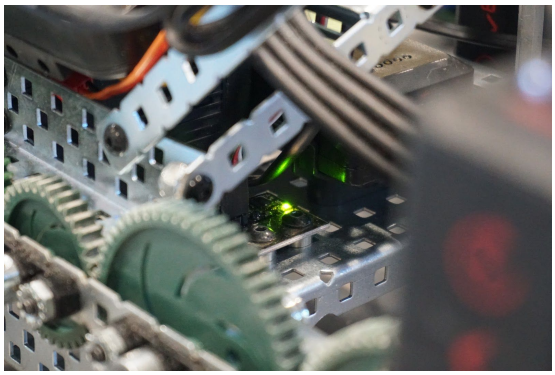
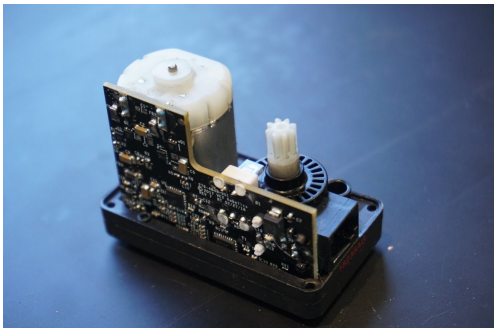
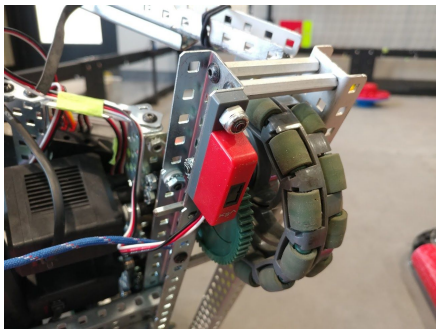
Vivian the VEX VRC Robot







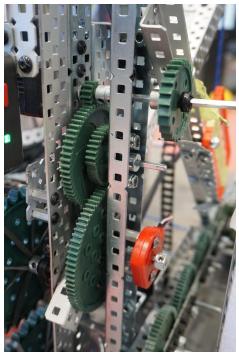
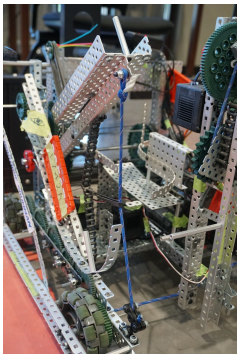




Purpose: Vivian was built to score caps, flags, and park on platforms for the 2018-2019 VEX VRC *Turning Point* game. She has driver control and autonomous programs.

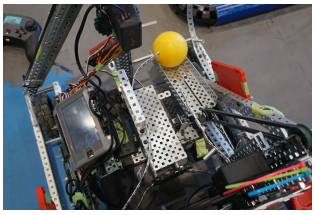
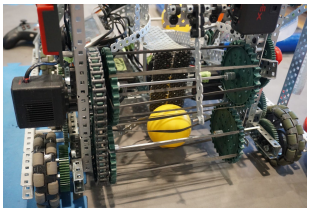
Mechanical systems:

Catapult

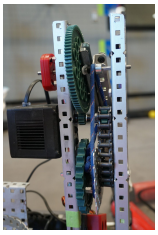
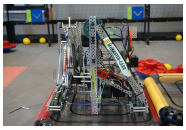
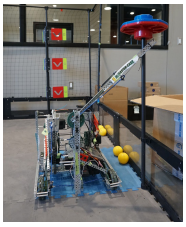
The catapult is powered by one motor and has a 1:11.66 gear ratio (12:60 * 36:84 with 60&36 tooth compound gear). It uses a slip/sector gear (note how teeth are ground off of the 36T gear) to rotate the catapult about 40° before slipping and releasing the catapult bucket, which is propelled by rubber bands. There is a ratchet gear to prevent rotation in one direction, so the catapult stays primed without the motor needing to actively hold a position. A potentiometer is used in the program to control the motor so that power is cut at the proper primed position.

Intake and ball path

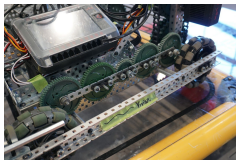
The intake is powered by one motor and uses rubber bands on sprockets (connected with chain) and anti-slip mat to raise balls to the ramp which guides them into the catapult bucket. The catapult can hold two balls at once and fire them to hit two flags at once.

Cap descoring arm

The cap descoring arm is powered by one motor and is a C-channel mounted to a linear rail, with a rubber band pulling it outwards. A pulley connected to the drive gear allows the channel to slide outwards as the angle of the arm changes. The channel retracts as the arm is moved back to its starting position.

Drivetrain



The drivetrain powers all four omni-wheels with 4 motors connected to gear trains. The wheelbase is as long as possible while still allowing Vivian to climb onto the platform without getting her belly stuck and becoming high-centered.

Sensors and programming

Vivian uses the aforementioned potentiometers along with a gyroscope, Vision Sensor, and quadrature encoder (all pictured on the first page) to traverse the field autonomously. The program is in C++. Most turns and straight-drive functions have acceleration and deceleration so movement is smooth, preventing inaccuracies caused by wheelspin and sudden high forces that can cause increased wear and loosen fasteners over time. The line sensor is not yet implemented.