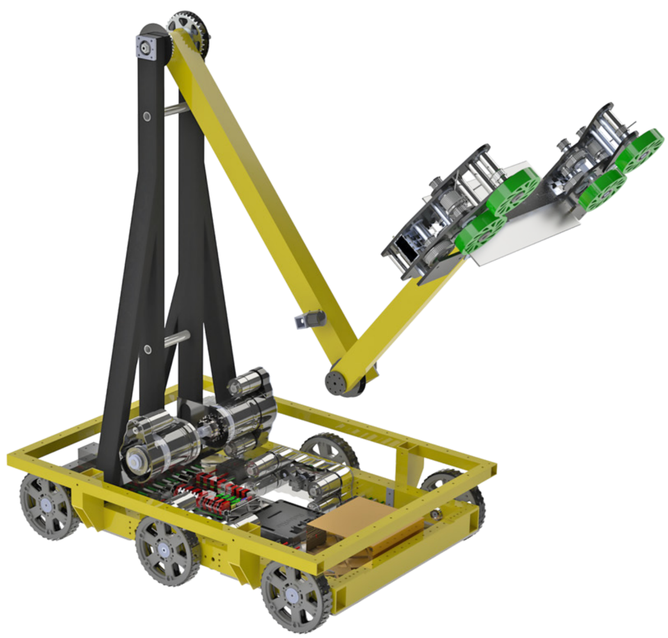
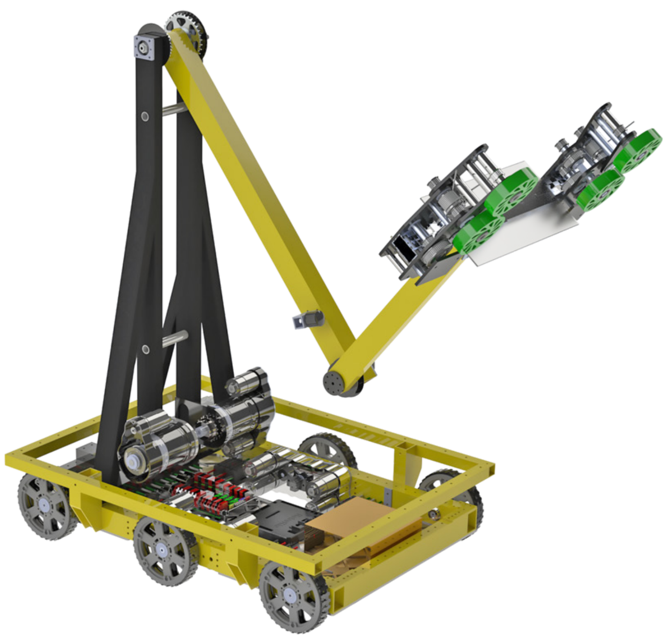
ROBOT DESIGN BOOK



TEAM 2485

THE ROBOT

This year's robot is named Neo, after the main protagonist from the Matrix, the final boss from Final Fantasy V, and the Greek root "neo" for new. As we finish our first decade as a team and head into the next one, Neo serves as an exciting reminder to keep looking forward to the new.



STRATEGY

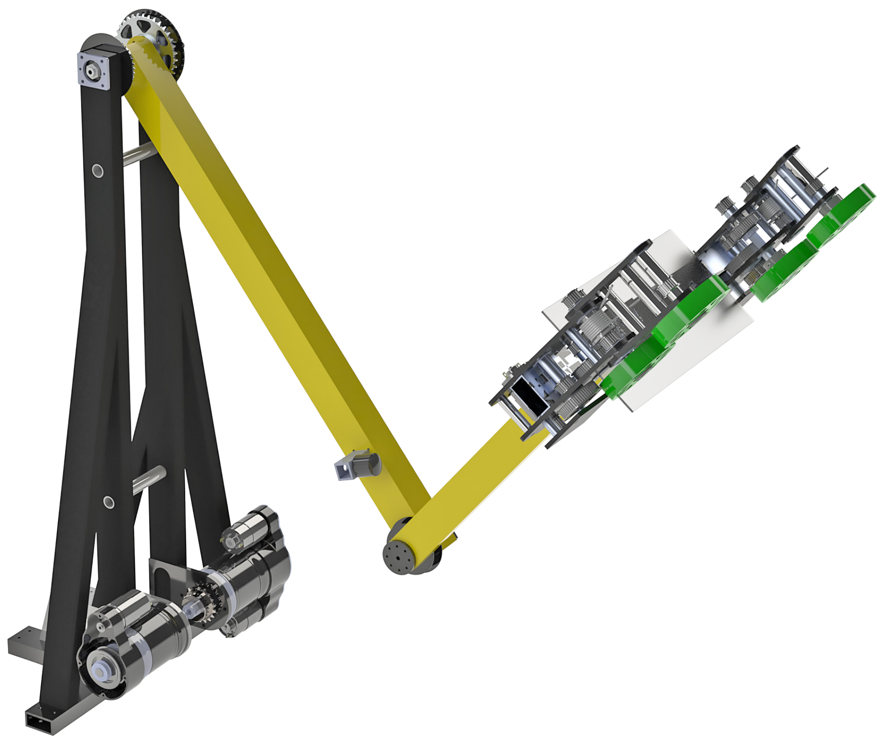
On kickoff, our team discussed which tasks in this year's game, FIRST Power Up, would be our priority. Our top priority was having a fast and maneuverable drive train. Next, we prioritized scoring on the scale, followed by scoring on the switch, and finally scoring in the exchange.

DESIGN

Neo uses an intake arm to take power cubes from the "pyramid" and put them on the scale, switch, or exchange, in order of priority. Our robot is under the weight limit as we did not use any pneumatics because of the weight and complexity that they add.

Additionally, our 8 775 pro west coast drive train allows us to drive quickly while maintaining control.

THE ARM



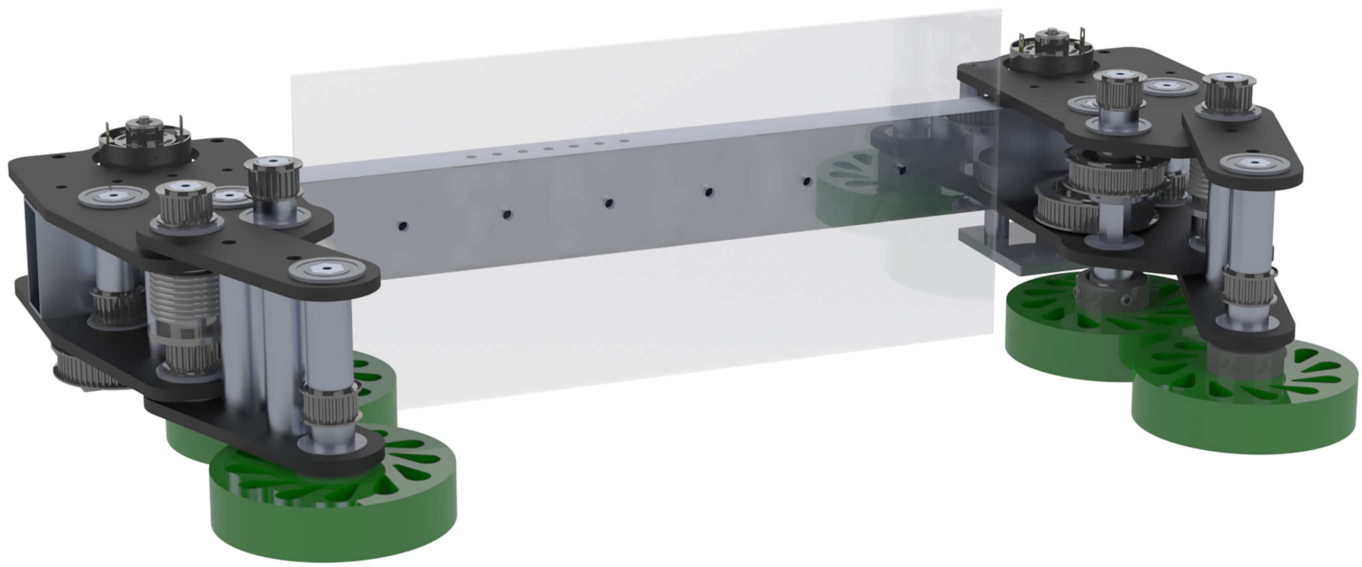
STRATEGY

Following kickoff, we explored potential designs of arms and elevators, and compared the complexity and efficiency of each. We ultimately decided to create an arm because although the arm was more difficult programmatically and required complex gearboxes, an elevator would have been more complex and slower to design and fabricate.

DESIGN

The arm was designed so to reach to all positions of the switch, scale, and pyramid without extending more than 16 inches outside of frame perimeter. The first stage of the arm was made from a 2” x 2” bar of aluminum which we powder-coated yellow. The second stage of the arm is a 2” x 1” bar of aluminum with the intake mounted on the end.

THE INTAKE



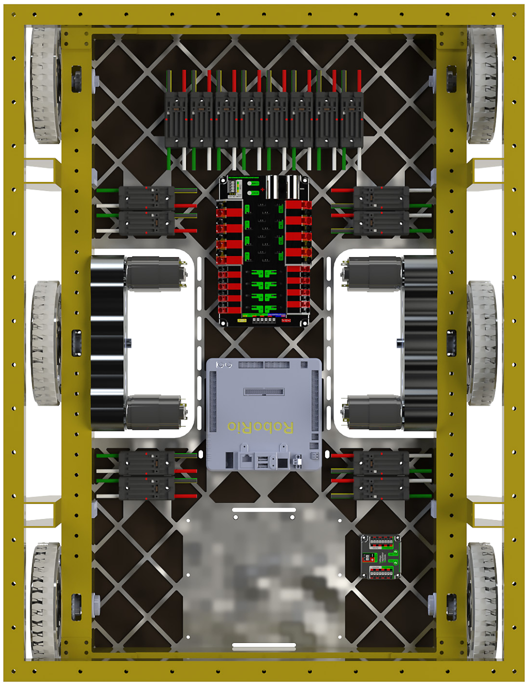
STRATEGY

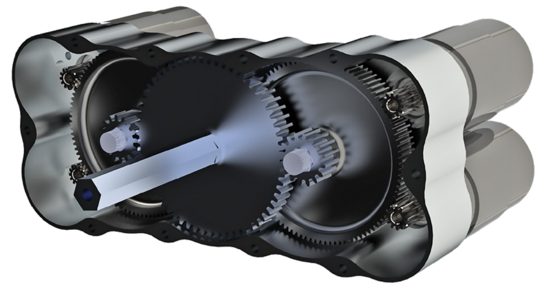
Throughout the prototyping and design process, our intake mechanism has been refined to its current state. This process began with simple wooden intakes that evolved into the more complex design we have now. We explored chain, pneumatics, elastics, and many wheel layouts. This led to the use of two spring loaded front wheels, and two fixed back wheels. These 4” rubber wheels allowed for easy intake, grip, and out-take.

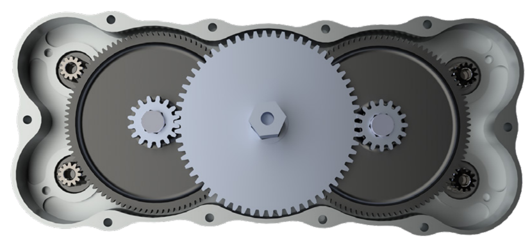
DESIGN

The intake is powered by two VEX 775pro motors, each independently controlled by Talon SRX motor controllers. Because of the 16” frame perimeter boundary, the intake was designed to be compact as to allow for easier arm articulation. Also, movement of the arm is easier to control because of the intake’s low mass, thus providing a higher sense of stability within the robot as a whole.

THE DRIVETRAIN







STRATEGY

We selected our drivetrain to ensure that we could be fast and maneuverable, and be able to drive on the platform. We chose a west coast drive with 6” Colson wheels because it fit the requirements of the game and we did not believe a more complicated drive train was necessary.

DESIGN

This year in our drivetrain instead of using CIMS motors, we utilized 8 VEX 775pro motors and two completely enclosed gearboxes. This allowed for a lighter but equally powerful drive system, with similar acceleration and top speed. These gearboxes were connected through the inside of the frame to 6” Colson wheels in a west coast drive setup.

SENSORS

STRATEGY

We use CTRE magnetic encoders to measure position and speed, allowing us to drive autonomously and move our arm to precise set points. (There is one encoder on each side of the drivetrain and an encoder at each arm joint).

The Pigeon IMU is a gyro that measures our position to help us drive curves autonomously.

Our robot has a Jevois camera that uses machine learning to detect cubes as well as provide a live video stream for our operators.

Neo also has an infrared sensor which uses a laser to measure distance. We use this to detect whether we are holding a cube.

Our current sensors measure how much current is being supplied to our motors, allowing us to accurately control their torque output.