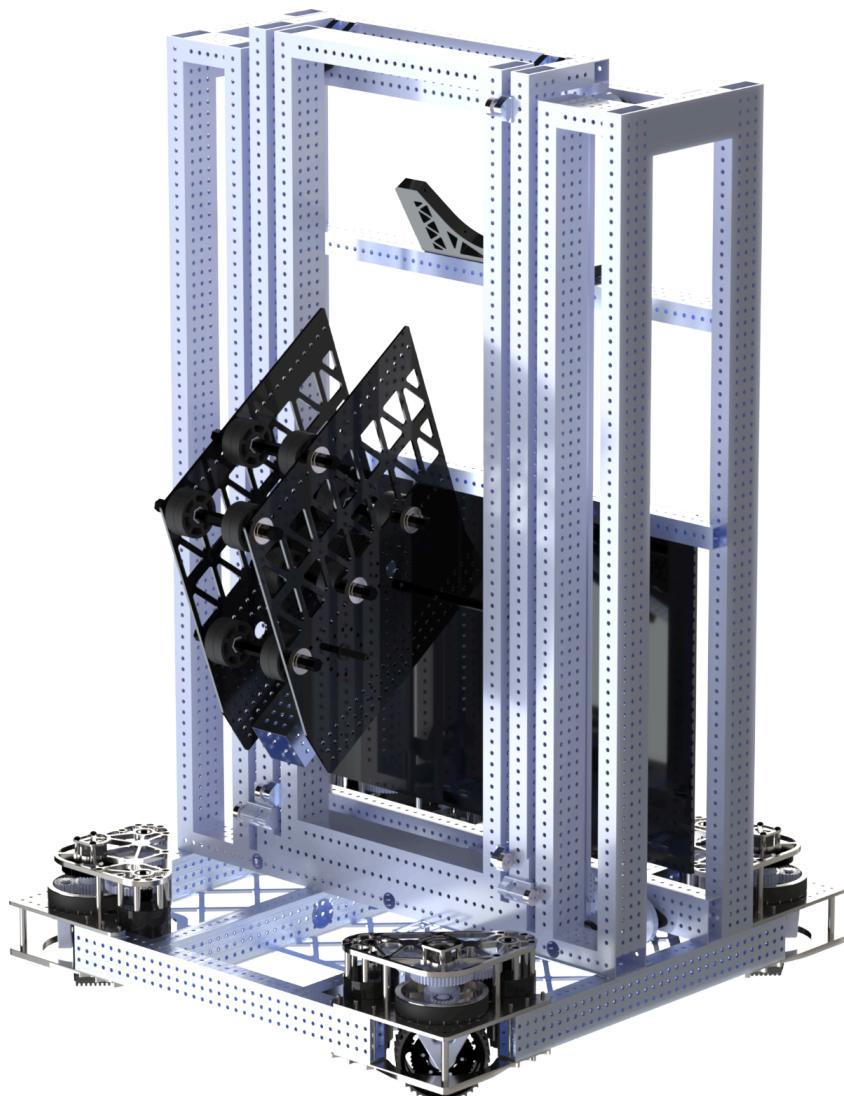


# ODYSSEY



## BEHIND THE DESIGN

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## ODYSSEY: BEHIND THE DESIGN

### DESIGN PHILOSOPHY

The design and planning of a robot dictates its function and capabilities throughout the rest of the season. Thus, it is critical during kickoff every year that we begin our design process by breaking down the game manual as a team and fully understanding the challenge ahead.

After analyzing the game rules, we create a list of different robot “archetypes”. Each robot archetype is a general robot style that focuses on a particular aspect of a game, such as a robot that can score coral on the reef and algae into the processor efficiently. After identifying different robot archetypes, we create a priority list taking into account resources such as time and money. We organize different tasks in the game into different groups: tasks we need to accomplish, would like to accomplish, and nonessential tasks we can work on later if we are able to. After deciding our goals for the competition season, we begin brainstorming and prototyping ideas that best satisfy these goals.

Need	Want	Nice to Have
Able to score Coral in L1 to L4	Able to receive coral from HP widthwise	Able to pick up coral off of the ground
Able to receive Coral from HP lengthwise	Shallow Climb	Be able to adjust our own coral
Able to complete quick cycles	Pick up Algae off the ground	Deep Climb
Able to remove Algae off of the reef		Index algae from the reef

## ODYSSEY: BEHIND THE DESIGN

### DRIVETRAIN

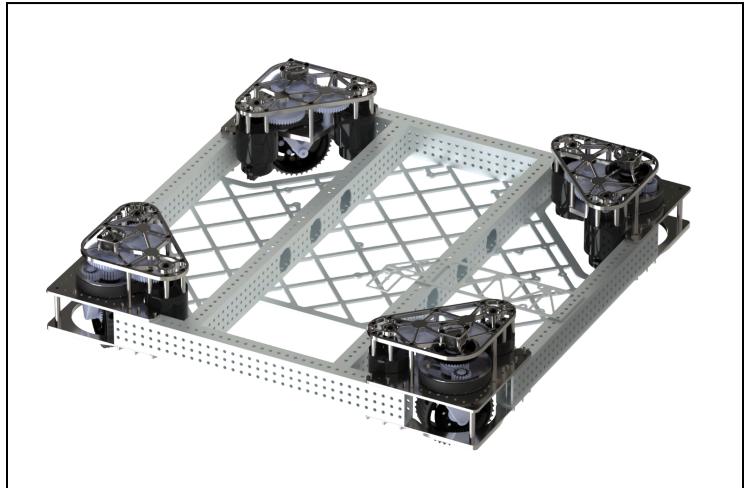
Features:

- ❑ 4-Wheel Swerve Drive
  - ❑ Kraken powered steer + drive
  - ❑ MK4i L3 Swerve Modules
- ❑ 26" x 26" aluminum chassis
- ❑ Aluminum custom-cut belly pan
- ❑ 4" VEX Grip Lock Wheels
- ❑ 2 crossbars for mounting with grommet holes to aid with wiring

Functions:

- ❑ High traction and staying power
- ❑ Swerve drive allows for faster cycle times and increased mobility

Odyssey's drivetrain is built to succeed in several critical aspects of the game this year. By using a COTS (Commercial Off the Shelf) swerve design, we decrease the points of error, leading to less in-pit fixes and greater mobility on the field. One key design change we made for this year is having a vertical electrical board. Unlike our previous years' electrical boards which were on the belly pan, we chose to mount this year's Eboard off onto the side of our elevator for easy access and safety of electrical components.



## ODYSSEY: BEHIND THE DESIGN

### ELEVATOR

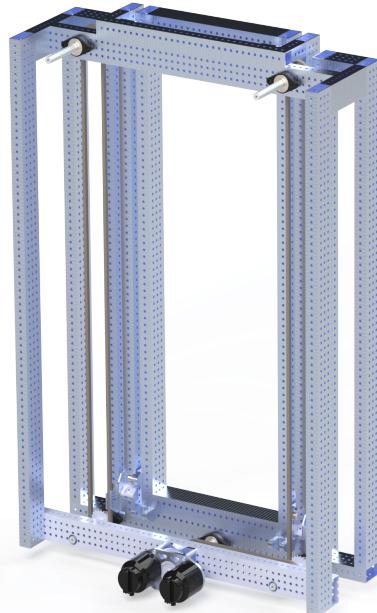
#### Features:

- Powered by 2 Kraken x60s through a REV 2 Motor Gearbox with a 5:1 gear ratio
- Made with 1/16" metal tubing
- Lightweight, rigid, and easy to mount onto the 2 stages that extend upwards
- Maximizes starting robot height and spans the entire 26" length of the robot

#### Functions:

- Able to extend ~96" upwards
- Can extend to its maximum height between 0.5 to 1 seconds.

Early in the season, we determined that a robust and efficient elevator system would be crucial in maximizing our scoring potential and making sure we have consistent game piece placement. To make this possible, we opted for a multi-stage cascading elevator, which allowed for precise vertical movement while maintaining a compact design. This approach minimizes weight while ensuring smooth and controlled extension and reduces the strain on the motors which improves our overall cycle efficiency. We used West Coast Products Greyt Elevator kit parts but had a custom design for our elevator, because it gave us the ability to streamline our design process while maintaining the flexibility to iterate and optimize our design based on the demands of the game and our needs, wants, and nice to haves. Our elevator uses 2 chains on either end to lift the stages to allow coral to pass through the center. The two chains are linked in with a centralized gearbox to ensure equal load distribution on both motors for a future climb mechanism.



## STATIC CORAL CHUTE

### Features:

- ❑ Made out of 1/16" lexan
- ❑ Mounted onto a 3d print angled to 120° to feed directly into end effector
- ❑ The curved "U" shape ensures coral centers itself automatically

### Functions:

- ❑ Able to receive coral in any orientation from the HP
- ❑ Orients coral lengthwise to feed into end effector

When discussing how we would feed coral into our end effector, we started considering the idea of a passive funnel. We recognized the need for a system that consistently fed coral in the correct orientation into the end effector, and so we designed a passive funnel to achieve this. Made out of 1/16" lexan and mounted to a crossbar that's connected to the fixed metal tubing of our elevator, this setup ensured that the transition from intake to scoring was smooth and didn't require any additional powered mechanisms. However during testing, we found that coral had the potential to fall into the funnel and get stuck vertically, which made it difficult for the end effector to intake unless the coral was pushed in lengthwise. To address this issue, we added a lexan stabilizer on top of the chute which made sure that the coral consistently fell into the correct orientation. This modification improved the efficiency of the coral chute and now allows for seamless and repeatable intakes that don't require extra adjustments during gameplay. By refining our original static coral chute, we created a passive system that's still effective and optimizes intake efficiency. This design allows Odyssey to maintain a high level of consistency without the need for complex mechanical redesigns.



## ODYSSEY: BEHIND THE DESIGN

### END EFFECTOR: CORAL SCORING

#### Features:

- Mounted onto the 2nd stage of the elevator with rivnuts
- Powered by 2 Kraken X60s
- Coral is moved through using 2" flex wheels on active rollers

#### Functions:

- Two beam breaks integrated into the end effector
  - Help position the coral in the end effector accurately for scoring on the reef
- Modular design allows the angle and height of the end effector to be changed easily
- Easily serviceable
- Can create a differential between the top and bottom rollers.

At the beginning of our prototyping for this season, we determined that a kind of intake was necessary to score coral and we narrowed our design options down to the orientation of the rollers and this impacted our design for our coral end effector. Our end effector is constructed from 2 1/8" lexan plates, with hex shafts running through both ends, each equipped with flex wheels to grip and control the coral as it's fed and moves through the mechanism. This setup of multiple rollers and the specific flex wheels ensures secure handling of the game piece while also maintaining a lightweight structure to make sure that we stay under the required weight limit and to reduce strain on our elevator. Our end effector is also directly connected to our elevator which allows Odyssey to score at Levels 1-4 efficiently. By leveraging the capabilities of the flex wheels, we've made sure that the coral remains stable during the movement of the elevator, reducing the chances of misalignment or drops. Through iterative testing, we refined the design of our end effector to optimize consistency, ensuring that Odyssey can quickly and effectively intake and score game pieces.

