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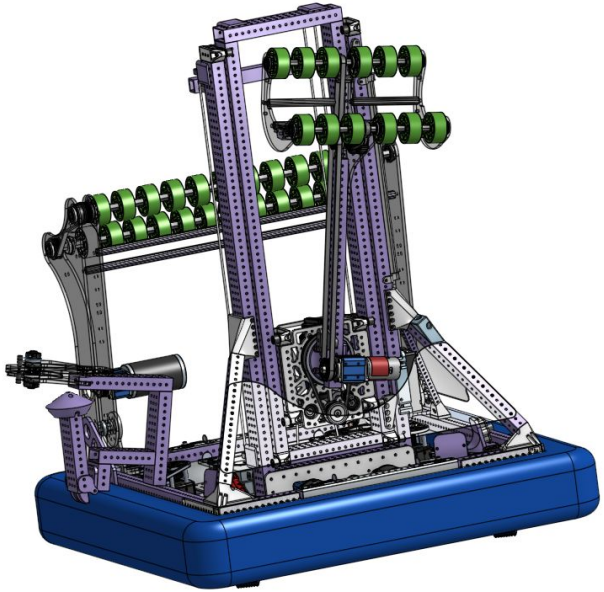
Engineering Process and Design



MAKO

Who is CyberTooth?

Where are we from?

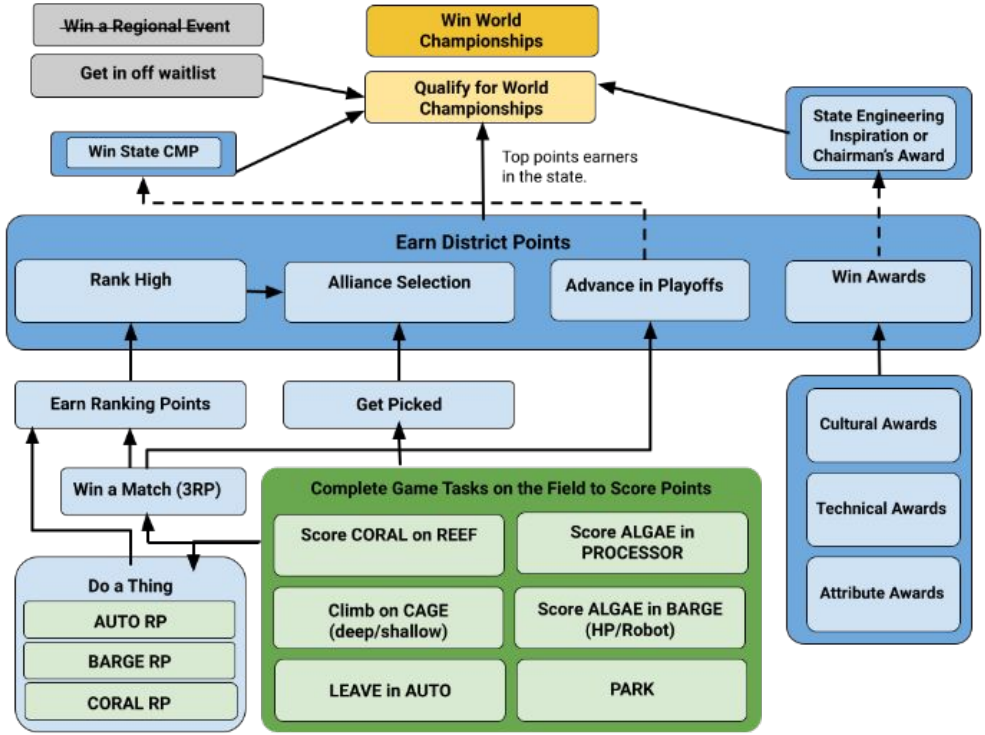
CyberTooth comes from Northwestern High School in Kokomo, Indiana.

What do we do?

"CyberTooth strives to create and grow a sustainable team to compete at the highest level in *FIRST* while positively impacting the culture and promoting STEM in Northwestern High School and throughout Howard County."
-CyberTooth Mission Statement

What are our 2025 goals?

- Top 8 at an event
- Medal at an event
- Win Engineering Inspiration at an event
- Win more than 7 playoff matches
- Have a winning season record
- Expand access to STEM in our local community
- Become a more diverse team
- Have the highest average auto score in the state
- Build a lighter, more focused robot



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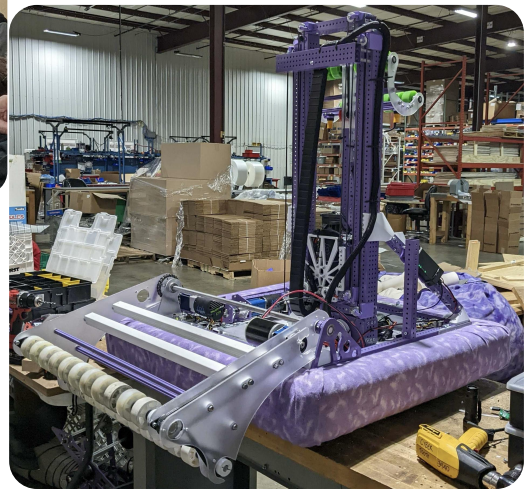
How are we accomplishing these?

- Working to include focused strategies into our robot design
- Participating in community demonstrations
- Continuing to build and maintain our open practice field
- Sharing team documentation
- Pushing student-led initiatives for recruitment

CyberTooth students presenting at IvyTech Kokomo with fellow area teams

Mako under construction



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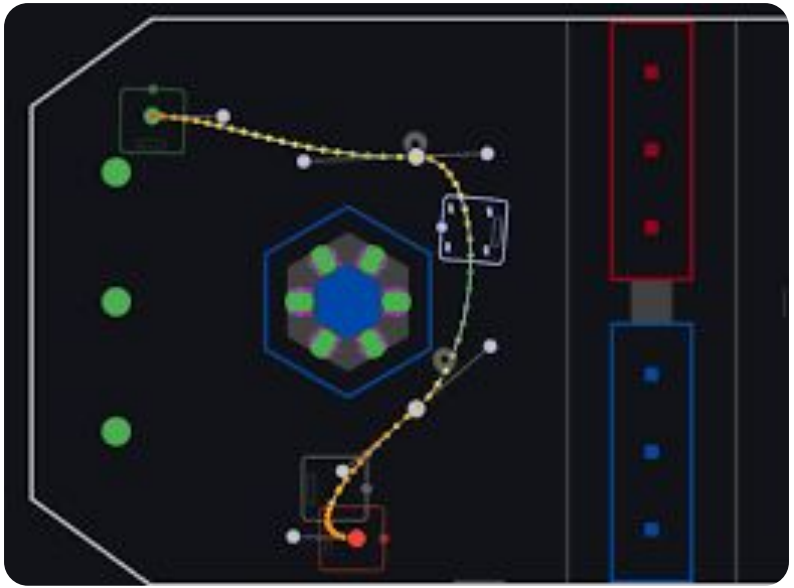
How effective have these actions been?

- Limited risk in design by targeting fewer game actions
- Awards efforts have been greatly increased and expanded to all team members
- Increased team presence amongst other *FIRST* teams, including local teams
- The near doubling of CyberTooth's number of students
- Highly focused and well-designed autonomous periods



Pathplanning autonomous periods

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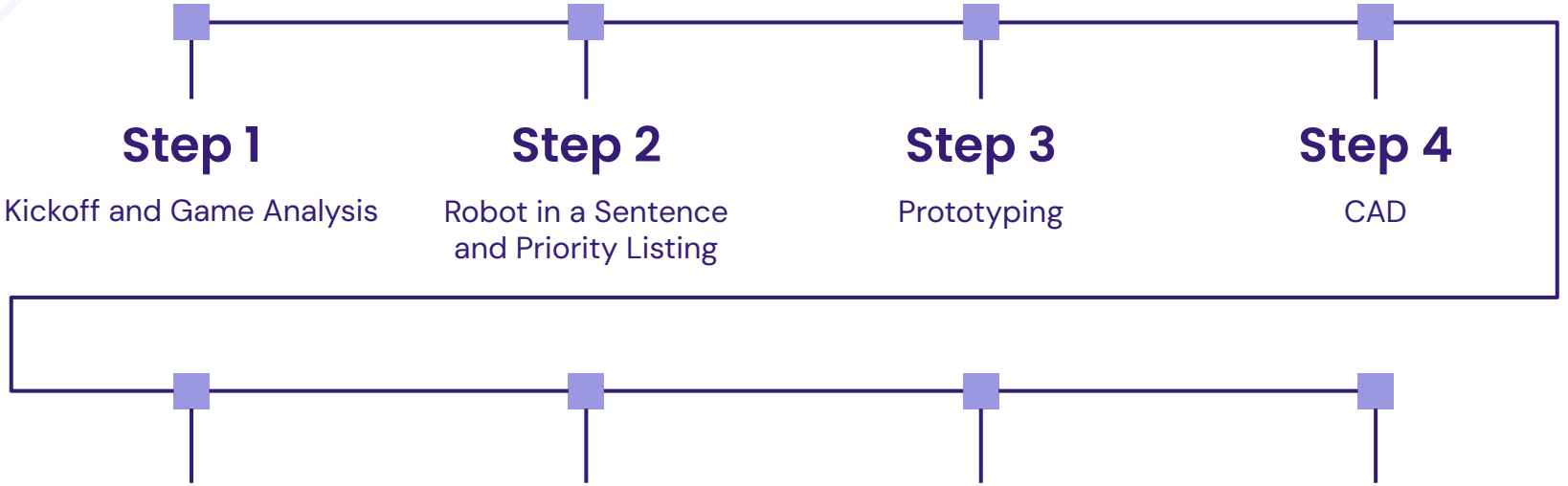
Build Season Timeline



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Build Season Timeline

Robot in a Sentence

“The 2025 CyberTooth robot accelerates quickly, is agile, can score quickly and effectively on L3 and L4 in Auto and L2, L3, and L4 in Teleop, can remove Algae from the Reef and pick up Algae from the ground to score in the Processor, picks up Coral from the Coral Station, and climbs the Deep Cage reliably.”

Priority List

- Team discussions gathering information on strategies for robot capabilities
- Logged and used in design to keep team on track
- Much more specific this year as to achieve greater team goals

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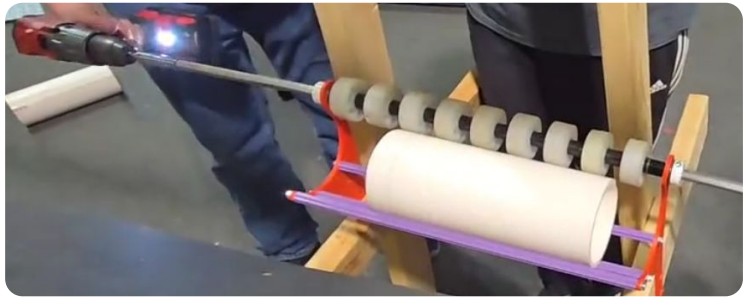
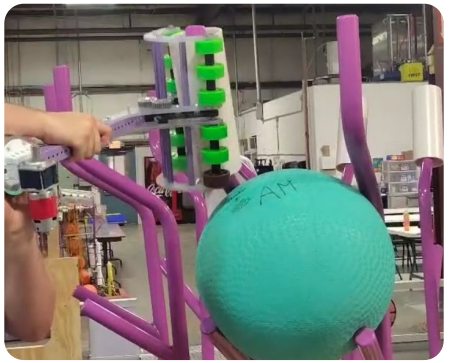
Prototyping

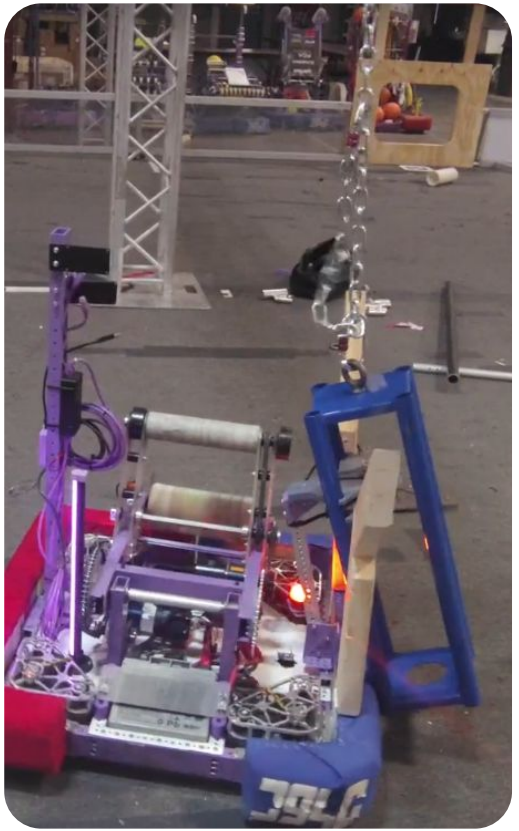
Below are some unique prototypes we developed and tested. All of these ideas, in some form, impacted our final robot design.



Testing CORAL claw at CORAL STATION



Testing CORAL claw on REEF



Testing EveryBot climber on 2023 off-season robot Cube Toot'r

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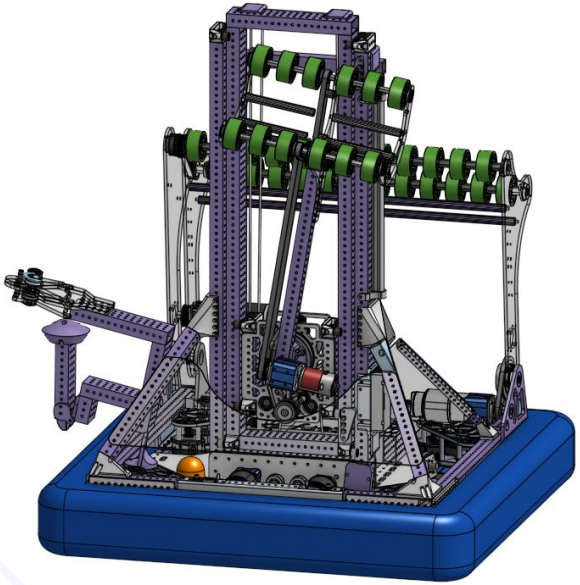

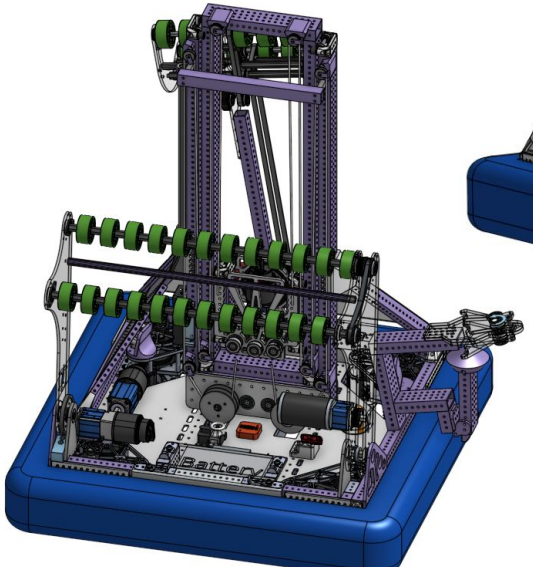

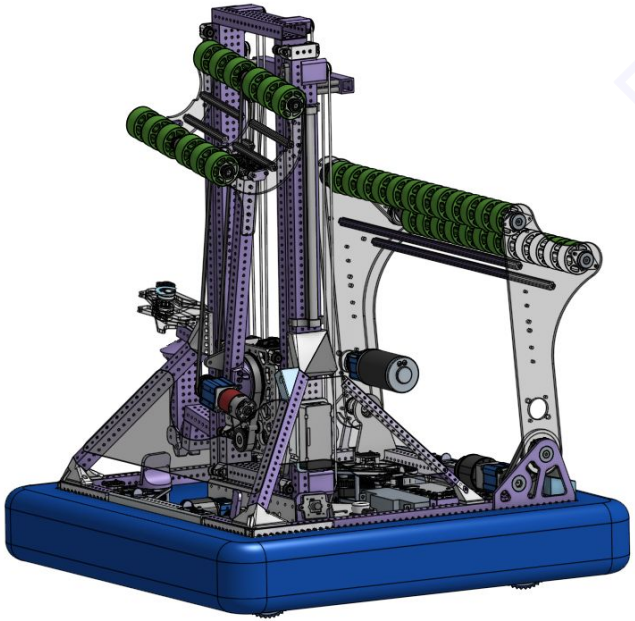

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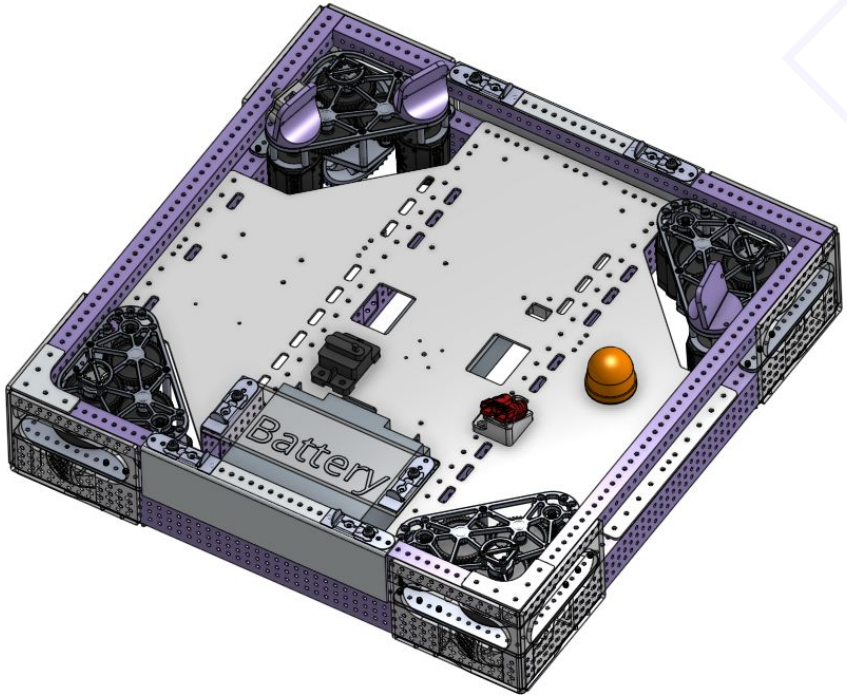
Drivetrain

- SDS Mk4i L2 Swerve Modules
- 16ft/s Free Speed
- ⅛” 2x1 Box Tube Construction
  - 26½x26½” square base
- 1x1 Box Tube Mounting Rail
  - Sits above the modules to provide consistent support for subsystems
  - Connected via a mixture of ¼” polycarbonate and aluminum plates
- Easy Access Battery Mount
  - Allows for fast, easy battery changes



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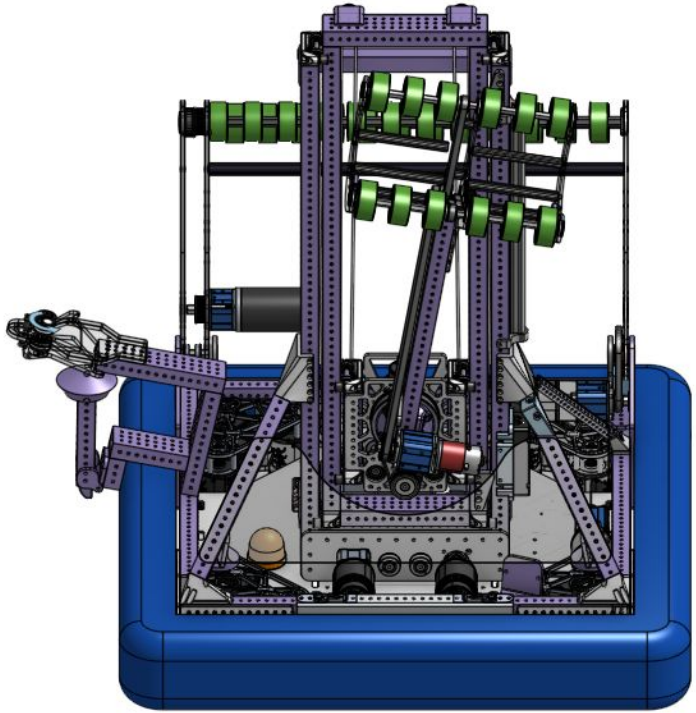
Claw & Elevator

- 2 stage elevator with a carriage holding arm and claw
  - Powered by two Krakens
  - 4:1 gear ratio
- Claw design for intaking and scoring coral
  - 3D printed parts to guide coral for alignment during intake and scoring
  - Powered by 775
  - 4:1 gear ratio
  - Auto-aligning capabilities and rapid scoring lead to low cycle times
- Pivoting arm to score coral
  - Powered by a Kraken
  - 50:1 gear ratio
  - We love arm
  - Methodically allows for alignment against reef to score



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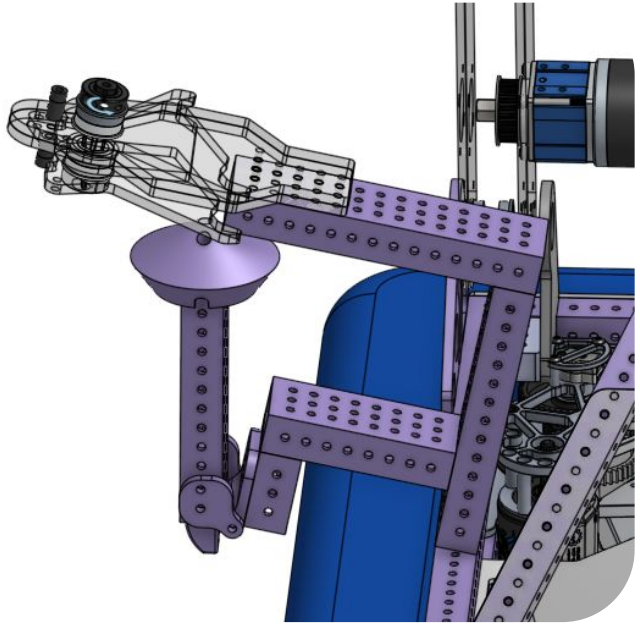
Climber

- Foot used to latch onto cage
- Powered by Kraken X60
- EveryBot style climber
  - Saved resources and is extremely effective
- Climbs deep cage
  - This is, strategically, the highest scoring action possible
  - Contributes to ranking points



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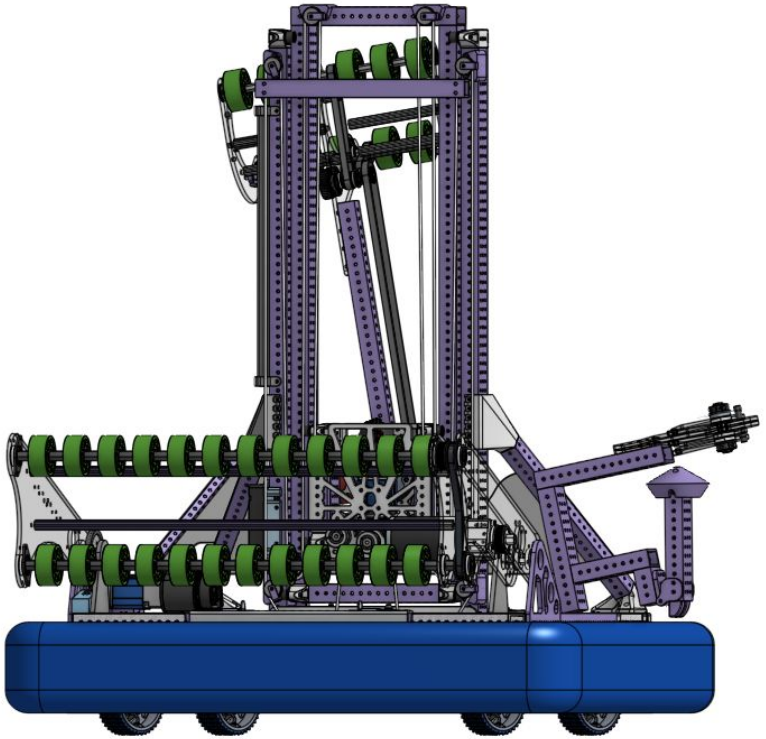
Intake

- X44 Kraken for intaking
- Kraken for raising and lowering
  - 12:1 gear ratio
- Uses compliant materials
  - Reduces weight
  - Improves structural integrity
- Intakes algae from the floor, intakes coral from the floor, scores algae into processor, and scores L1 coral
  - Consolidation of subsystems saves resources



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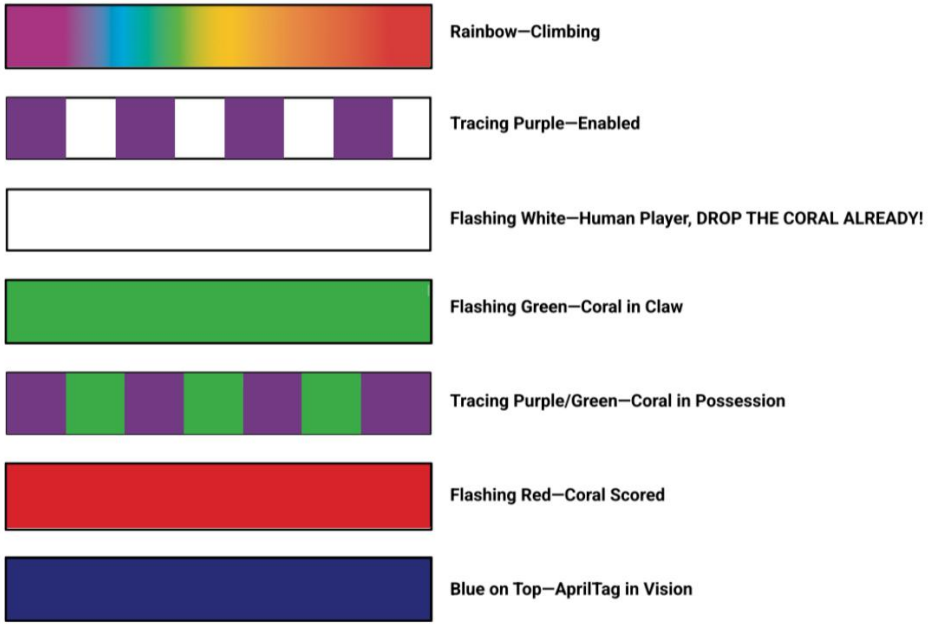
LEDs



UnderGlow:

This feature makes Mako more elegant, unique, and serviceable, as the increased lighting makes bellypan work easier.

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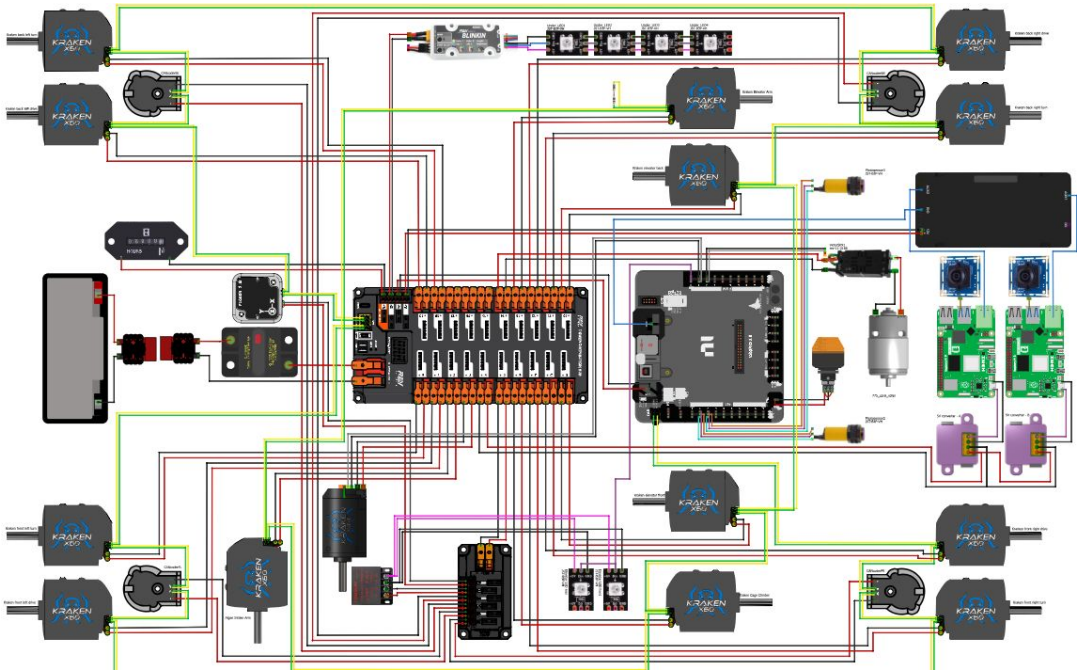
Electronics:



Sensors:

Limelights used for alignment.
Beam sensors used for tracking coral in claw.

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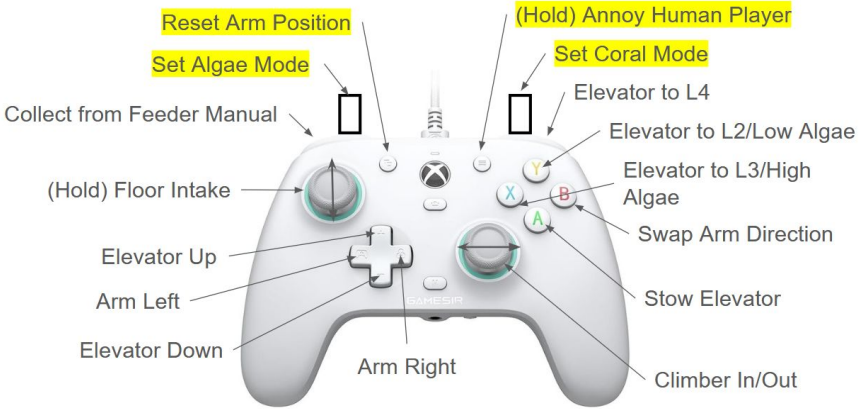
Controls



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Thanks!

Do you have any questions?

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See us in our pit!



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