FIRST TECH CHALLENGE

TECH TURTLES

10179

CENTER

STAGE

2023-2024 Engineering Portfolio 10179

10179 Tech Turtles

Meet The Turtles

Team Plan

Meet the Tech Turtles! Delving into the realm of FIRST Tech Challenge with nine years of experience, we're ready to emerge as a more prominent team this year. Fueled by a dedicated and determined group of students, we're geared up to confront challenges head-on and reach new heights.

Our team consists of industrious students, each contributing diverse skills to conquer this year's challenge. The journey has been a continuous learning experience, encompassing enhancements to our robot and the development of teamwork skills.

Sponsors

FWM Fort Walton Machining
Dead Center Perfect Manufacturing

ASEI
Applied Systems Engineering Inc

Bit Wizards

talking PARENTS

Team Accomplishments

Every turtle has their own accomplishments and goals!

- **Anna**: Created and maintains a robust excel scouting workbook that allows for each interpretation of recorded data.
- **Brody**: Designed and manufactured the first FTC co-axial swerve drive to compete in Florida.
- **Christian**: Implemented advanced control theory concepts to precisely manipulate subsystems.
- **Emma**: Gained knowledge in mechanical assembly and design strategy; assembled linear slides and surgical tubing intake pieces.
- **Jackson**: Successfully designed a worm gear lift system and outer side plates.
- **Jaiden**: Acquired skills in Computer-Aided Design (CAD), assembled the intake ramp, and excelled in rapid repairs.
- **Trey**: Assembled both the lift worm gear-box and the linear slide gear box.
- **Wes**: Delved into programming, successfully programmed the mecanum test bot, and assembled the claw.

2023-2024 Team Goals

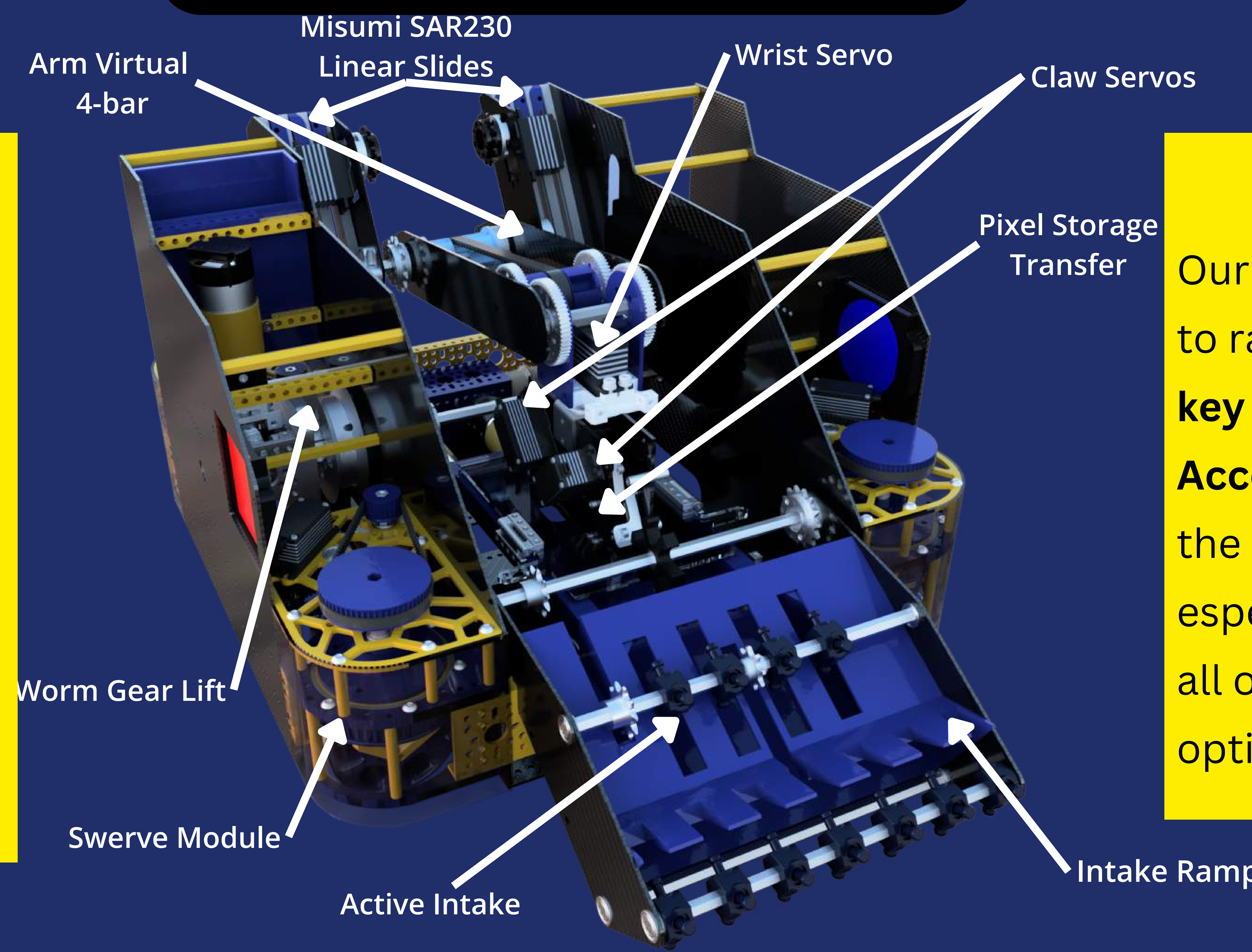
- Host **workshops** at our venue, **inviting teams** to utilize our field, **collaborate on manufacturing**, engage in **joint practice sessions**, and offer support as needed.
- Facilitate a **mentoring program** where **new members** have the opportunity to shadow experienced members, allowing them to **acquire vital skills** throughout the season.
- Develop **relationships with teams** both across the state and country

10179 Tech Turtles
Robot Overview & Strategy

GAME STRATEGY

Our seasons **game strategy** is to:

- Have **fast cycles** through the stage door.
- **Precision** placement of pixels on the backdrop.
- **Re-arrange** pixels to create **mosaics.**
- Quick and secure hang during end game.
- Autonomous cycles to maximize points.

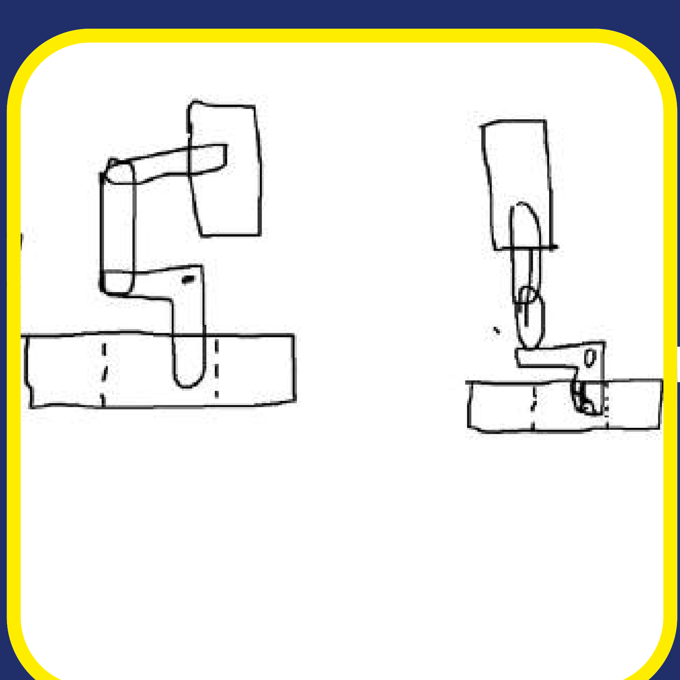


DESIGN PROCESS

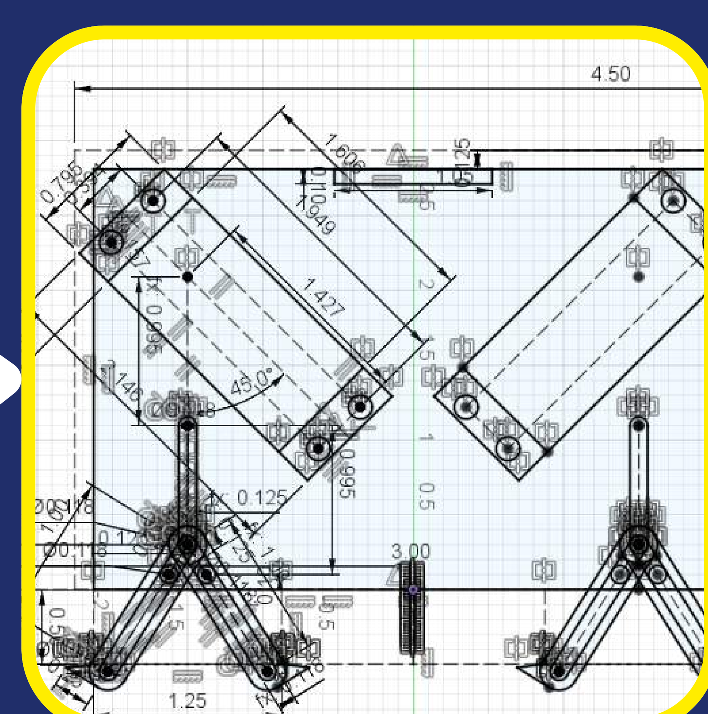
Our **MAFS** design philosophy allows us to rapidly improve our designs with **4 key features** in mind: **Modularity, Accessibility, Flexibility, Speed.** We use the fail fast, fail often iteration strategy, especially in CAD, for testing ideas from all our team members and choosing optimal, tested solutions!

Iterative Process

We follow a **5-step iterative design process** when creating subsystems and components on our robot to constantly **improve**!


Brainstorm


Prototype


CAD & Design

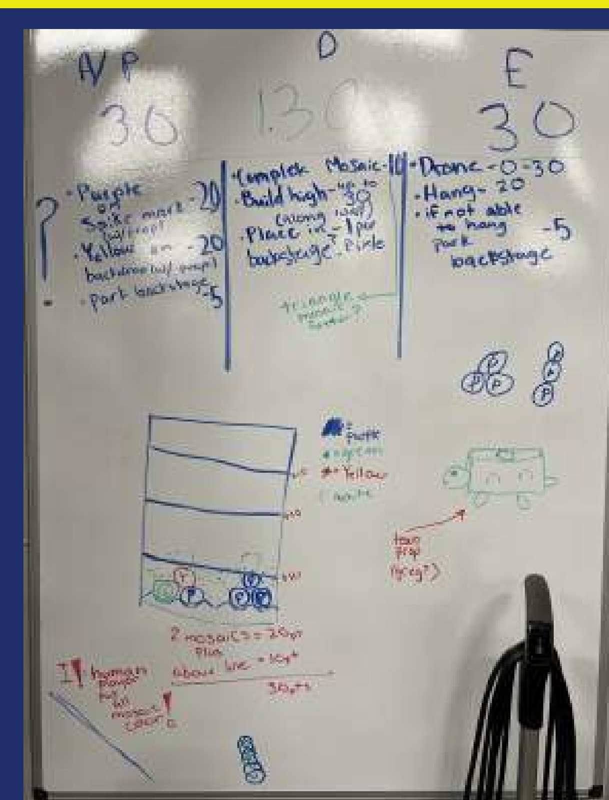

Build


Iterate

10179 Tech Turtles
Design Process

MECHANICAL

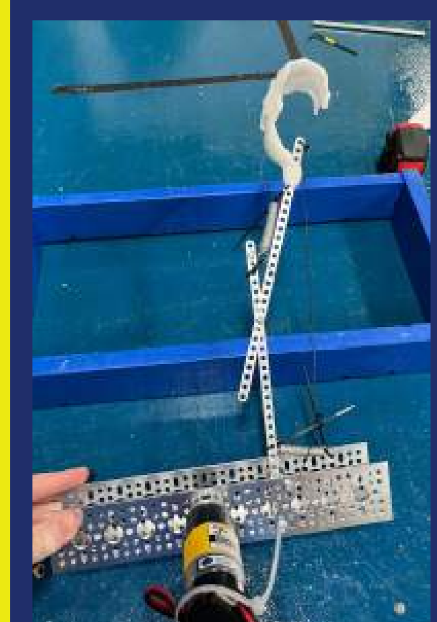
BRAINSTORM



In defining the robot's design, we considered:

- Created a list of different scoring strategies, ranking them through point potential and their required mechanism complexity.
- Began researching individual subsystems, listing their pros and cons in combination with the scoring strategies.

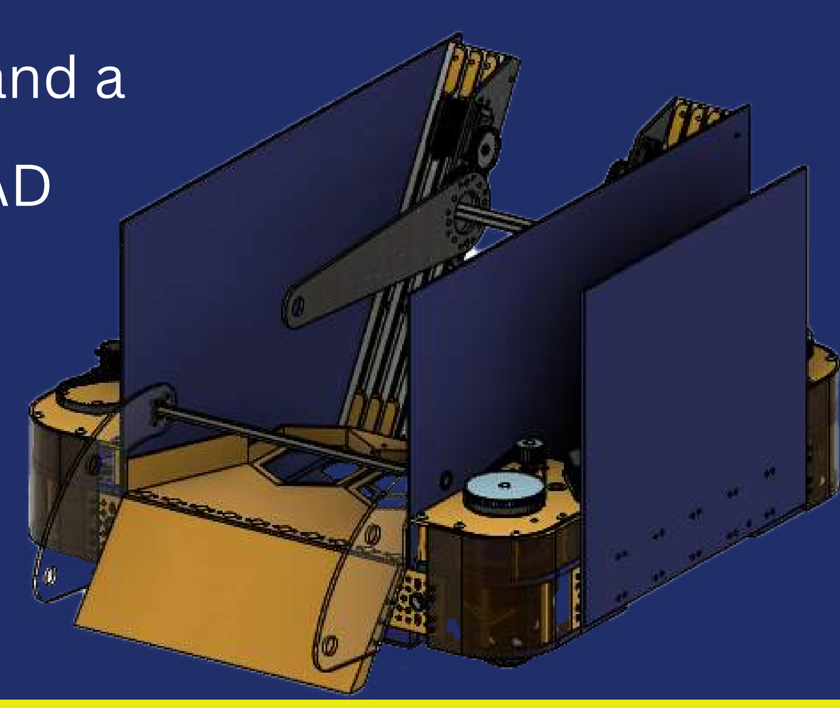
PROTOTYPE & TEST



- Once potential subsystems were determined, we began prototyping them with polycarbonate, 3d printed pieces, and COTS parts.
- Once the mechanisms were tested, we began sketching out version 1 of the robot, doing our best to choose mechanisms that complemented each other and maximized the scoring potential.

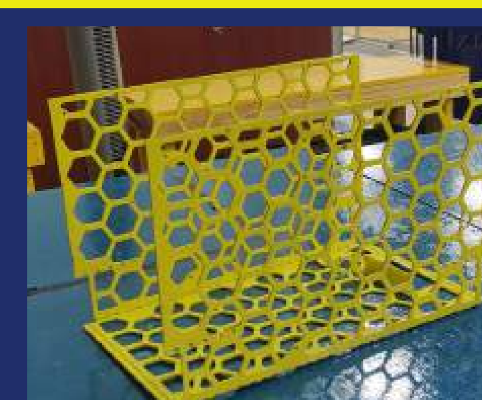
COMPUTER AIDED DESIGN

After mechanisms have been properly prototyped and a strategy is determined for the robot, we begin to CAD the robot. This allows us greater creative flexibility, assures that parts have clearance and proper placement, and the ability to export parts to be manufactured.



MANUFACTURING

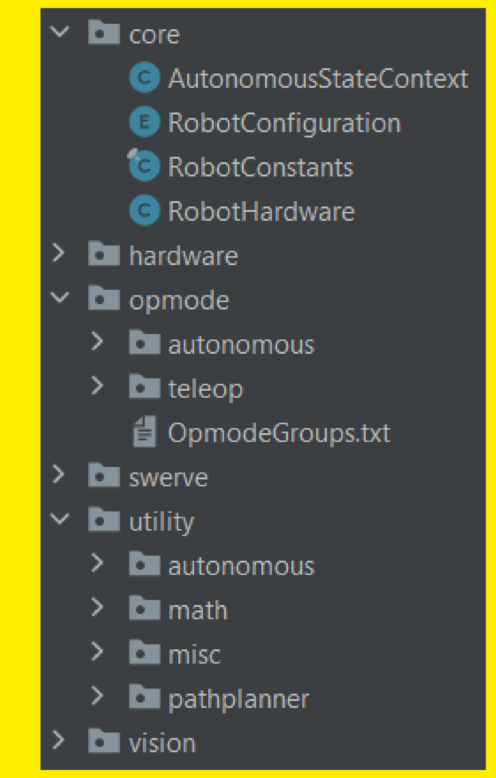
After the CAD of the robot is finished, we begin to manufacture parts using in-house routers, access to a 5-axis CNC HAAS, and our sponsors' water jets to cut carbon fiber plates.



SOFTWARE

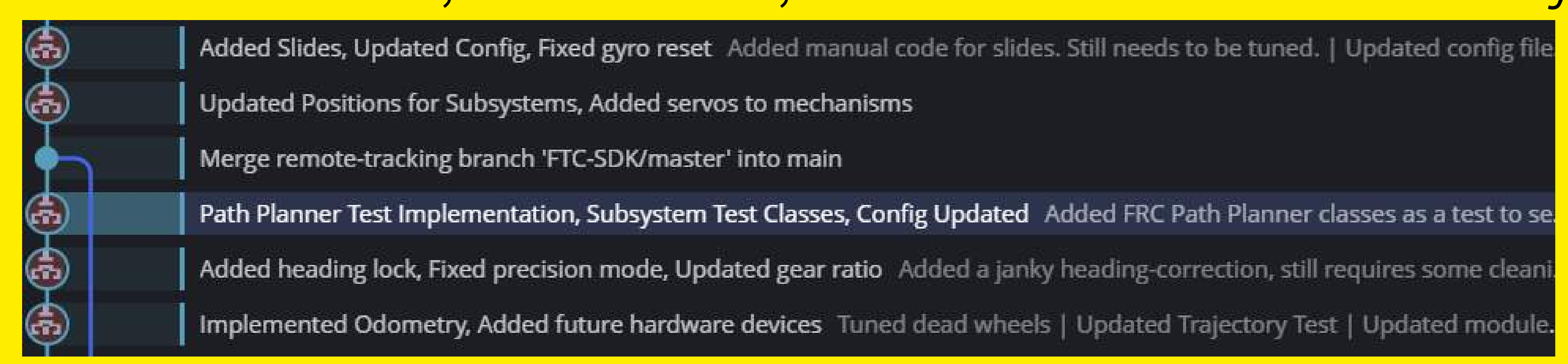
MODULAR CODEBASE

We use Android Studio with a mix of the Java and Kotlin languages, and continue to build upon a modular codebase consisting of over a hundred files. These files include hardware wrappers maximizing efficiency, custom localization code, implementations of control theory concepts, and simulation classes.



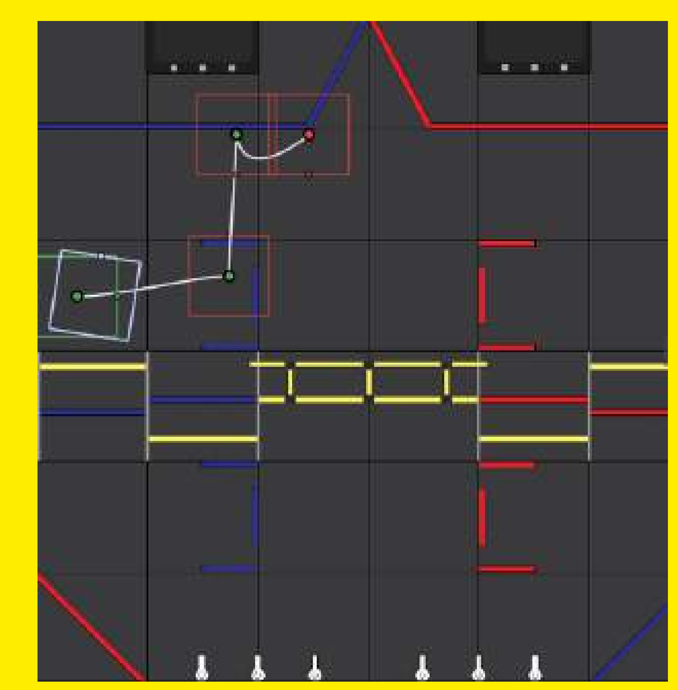
VERSION CONTROL

All changes are committed to GitHub, allowing us to have version control back to the start of the season, and easy delegation of tasks. Most importantly, it enables for collaboration with branches, code reviews, and access to the code from anywhere.



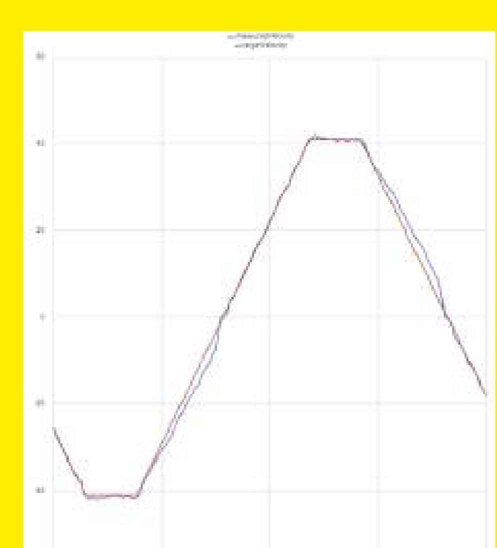
TESTS AND SIMULATORS

- With a custom implementation of FRC's PathPlanner GUI we can simulate and generate our robot's autonomous path with ease.
- JUnit tests allow for testing state-based autonomous without the robot.
- EasyOpenCV Simulator allows us to use pictures saved by the robot to test vision pipelines and record



LIBRARIES

We use open source libraries to speed up the implementation.

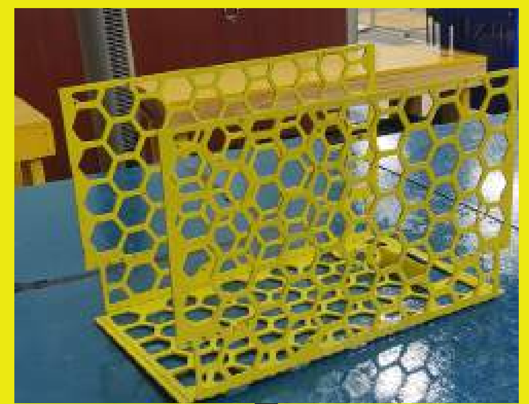


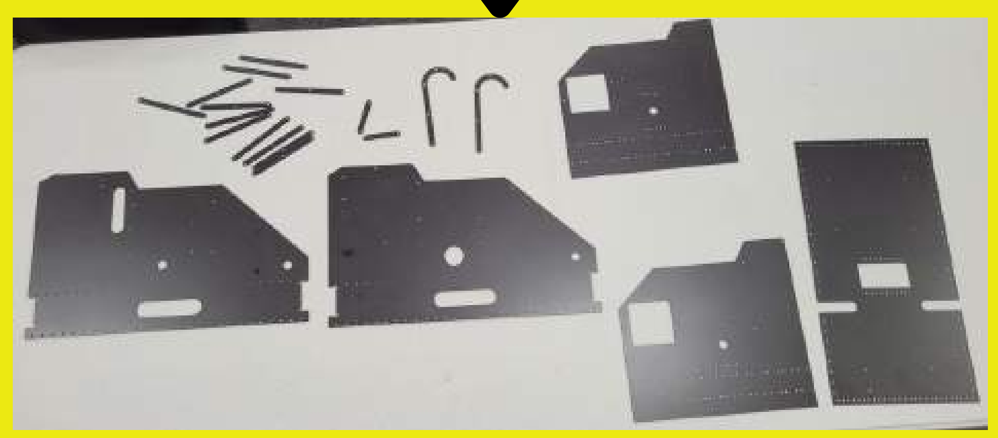
- Roadrunner is used to interface and calculate the odometry modules.
- EasyOpenCV with custom pipelines is used for all vision detection.
- Acme Dashboard lets us edit values and display graphs in real time with the robot's transmitted data.
- OpenCSV is used to store all robot log data in CSVs to be easily read.
- EJML is used to optimize all matrix math.

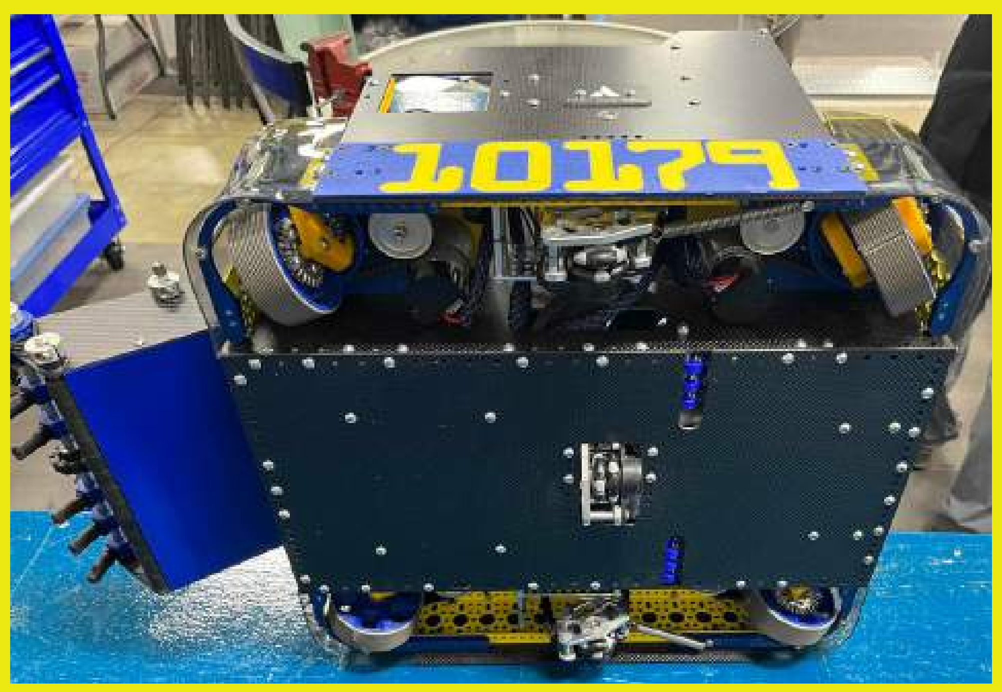
10179 Tech Turtles
Swerve & Odometry

Drivetrain Design Features

- 16" x 17" x 11" low-profile drive base facilitating smooth passage through the truss and under the stage door.
- Plate pocketing to reduce robot weight.
- Modularity: Designed swerve modules that can be affixed to drive trains of any size.
- Accessibility: Simple assembly with minimal bolts and matching part geometries.
- Flexibility: Incorporation of Lexan and a 3D-printed skirt ensures low ground clearance and prevents pixels from getting under the robot.
- Speed: Each module has a 10:1 ratio, allowing for traversal of the entire field in less than 1.2 seconds.







Odometry & Packaging

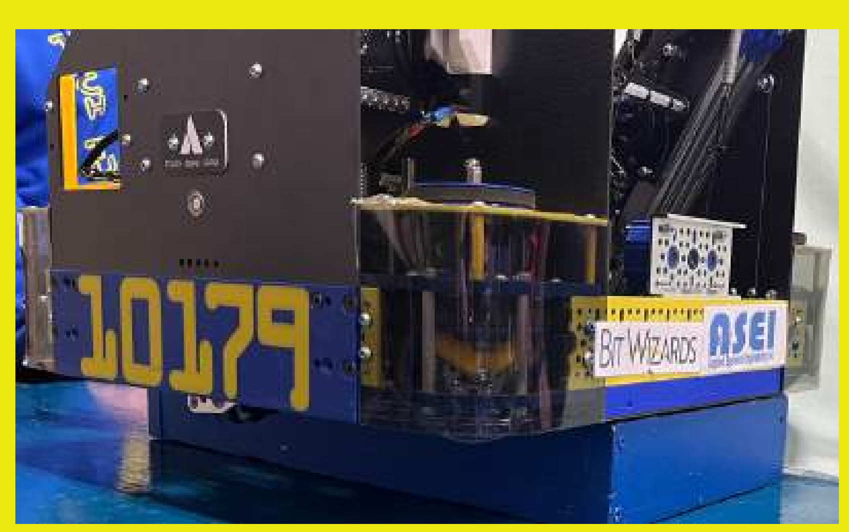
- **Three wheel odometry system that allows for accurate localization when driving in Tele-Op or Autonomous.**
- Low center of gravity with 7 motors at the base of the robot, removing the possibility of tipping with fully extended slides.

Problem: Traditional drive systems like mecanum and x-drive demonstrate inefficiency during strafing, resulting in speed loss and compromised traction due to their wheel configurations.

Solution: Swerve drive, despite its design complexity, overcomes these drawbacks, and allows for superior speed and traction.

Key Features:

- Enhanced maneuverability for versatile scoring
- Precise control and alignment for strategic gameplay



$$
\begin{bmatrix} v_{1x} \\ v_{1y} \\ v_{2x} \\ v_{2y} \\ v_{3x} \\ v_{3y} \\ v_{4x} \\ v_{4y} \end{bmatrix} = \begin{bmatrix} 1 & 0 & -r_{1y} \\ 0 & 1 & r_{1x} \\ 1 & 0 & -r_{2y} \\ 0 & 1 & r_{2x} \\ 1 & 0 & -r_{3y} \\ 0 & 1 & r_{3x} \\ 1 & 0 & -r_{4y} \\ 0 & 1 & r_{4x} \end{bmatrix} \begin{bmatrix} v_x \\ v_y \\ \omega \end{bmatrix}
$$

Inverse Kinematics

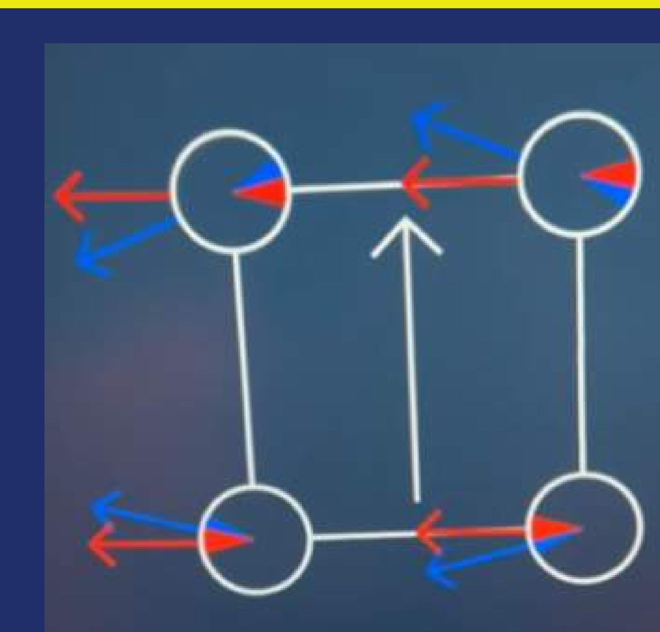
Inverse kinematics involve solving equations that determine the individual wheel speeds and steering angles needed to achieve a desired overall robot motion. By employing inverse kinematics, the swerve drive can efficiently navigate in any direction with precise control.

Problem: The drive train was drawing so much current that we would have frequent brownouts

Solution: Changing from an 8:1 gear ration on drive to a 10:1 ratio

Key Features:

- More torque
- Lower current draw while driving
- Batteries last the entire match

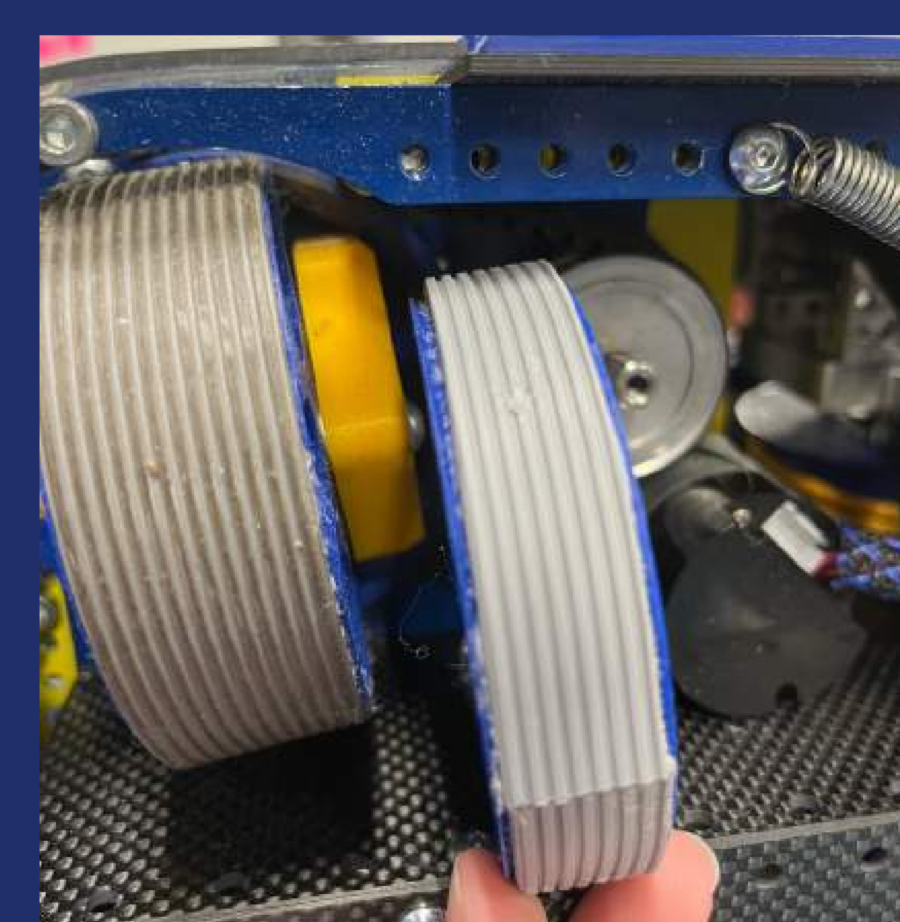


Problem: Swerve wheels sank into the foam tiles causing increased friction when the modules turned.

Solution: Increasing the wheel width allowed for better weight distribution over a greater area.

Key Features:

- Increased power efficiency and improved turning speed.
- Prevented tile sink, allowing for lower ground clearance.

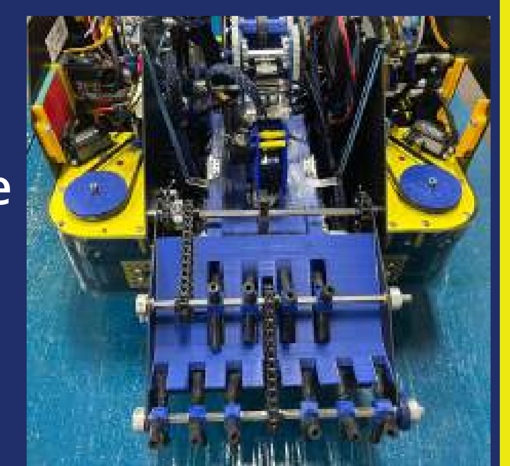


10179 Tech Turtles
Intake

DESIGN PROCESS

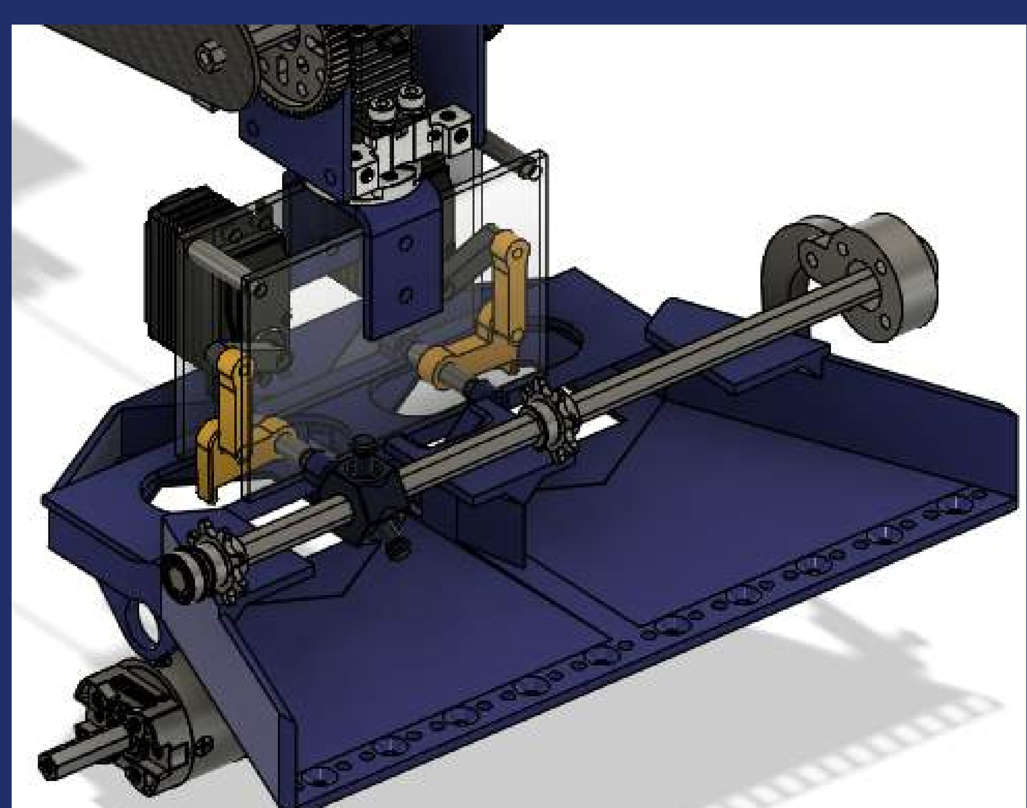
Problem: Intaking pixels to a front-back orientation requires an intake that funnels pixels to < 5in width thus minimizing the overall effective intake width. A smaller intake width makes grabbing pixels more challenging.

Solution: Widening the intake to 8.5" and then using 3d printed funnels to transfer to ideal orientation allows drivers to more easily and reliably intake pixels.



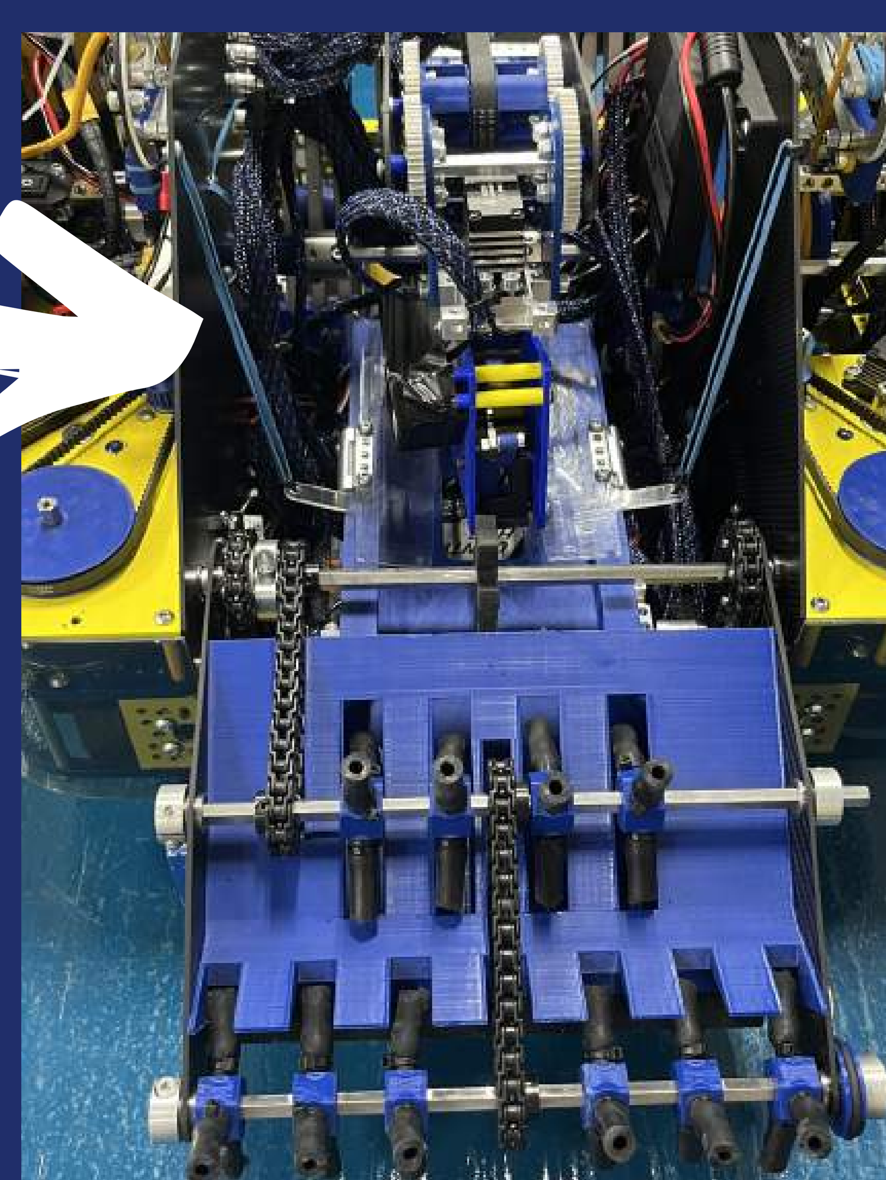
Key Features:

- 8.5" width intake profile.
- Drop-down intake assembly allows for protection of intake while driving.
- 1150 rpm intake motor powering 10 surgical tubing rollers attached with 3d printed holders.



Side-by-Side Transfer

The side-by-side transfer system showed promising results in early season testing, but operational challenges arose during actual driving. Alignment issues with the claw and during driving we noticed pixels being intaked on the same side, requiring us to spit the unseated pixel out. Additionally, dead spots occurred, hindering the system's ability to grab or move pixels effectively.

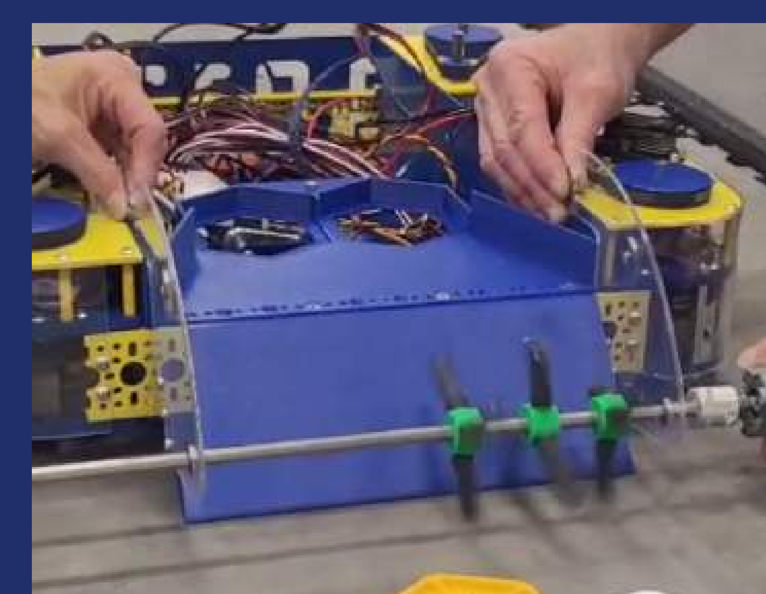


Front-to-Back Transfer

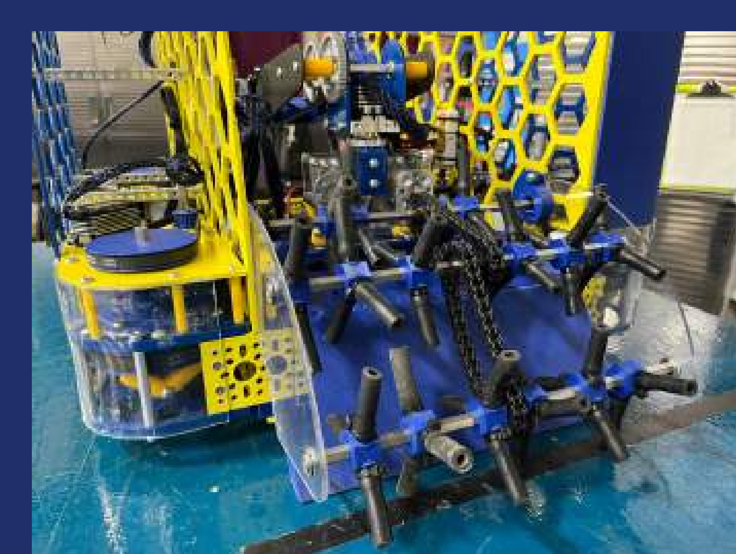
This design channels pixels into a single file line, and incorporates hinged Lexan pieces to prevent pixel flinging into the robot. The alignment of pixels is fixed by giving the intake the role of aligning pixels for the claw.

Brainstorming: We began manufacturing different materials to test their effectiveness on the pixels. These materials included silicon molded flaps, TPU printed flaps, surgical tubing, and compliant wheels.

Prototyping: After seeing the behavior of the pixel with different materials we began drawing up different intake designs to prototype.



Testing: Following the identification of the most efficient materials, we began designing diverse intake mechanisms. These designs were tested with calculated ratios, aiming for nearly instantaneous pixel intake.



Iteration 1: After we determined that surgical tubing rollers were the most effective, a ramp with alternating rollers was designed.

Weaknesses:

Pixels could fling out during the intaking process.

Difficulty with picking up off the stacks

Iteration 2: Introduced a bottom roller for improved stack picking. Implemented a 3D-printed cover on the ramp to guide pixels seamlessly to the transfer, preventing any flinging. Additionally, the intake is designed to correctly orient the pixels stored front to back.

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Slides & Arm

Problem: Same-side scoring mechanisms require robot to spin 360 degrees every intake-deposit cycle slowing down overall cycle time.

Solution: Pass-through design using carbon fiber arms and linear slides allows robot to maintain direction while transferring pixels from front-to-back of robot achieving a more efficient scoring process.

Key Features:

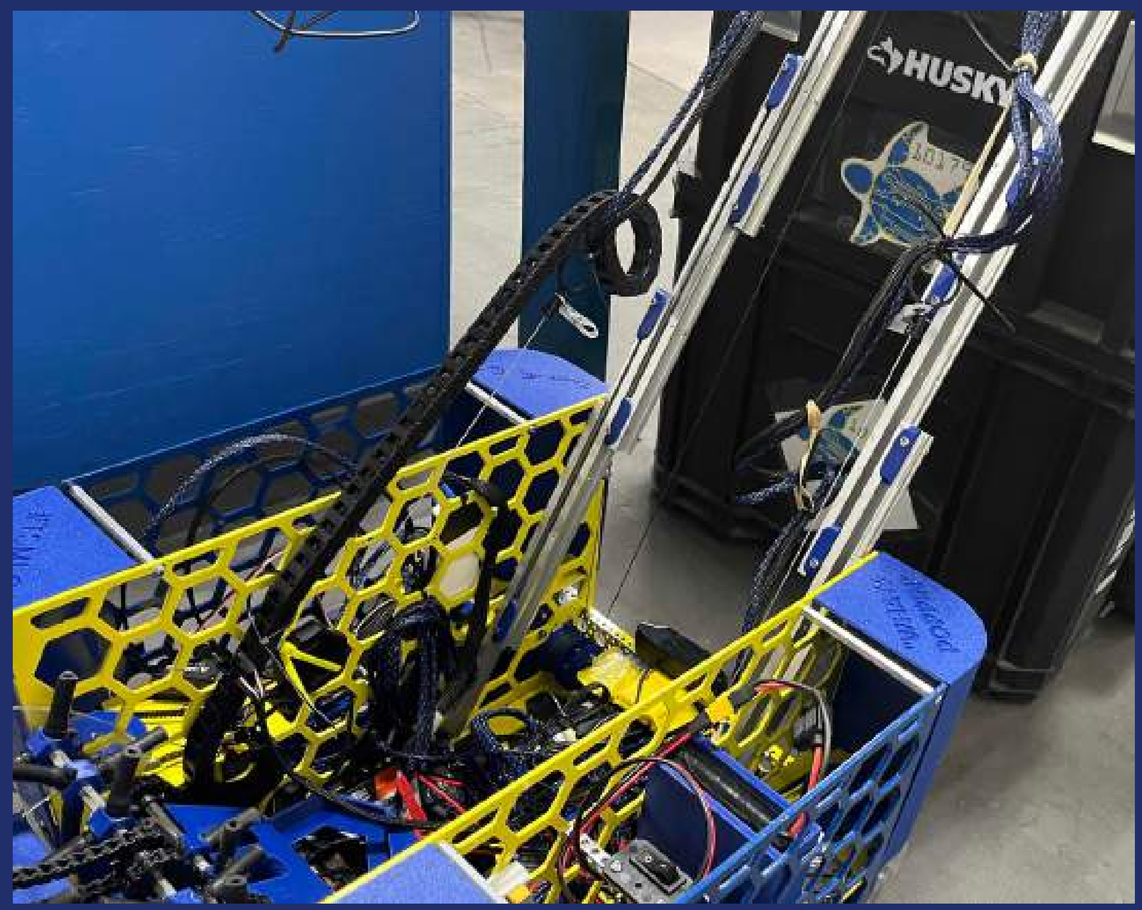
- Arm ratio and length calculated to achieve an optimal .44 second travel time.
- 3x sar330 linear slides combined with 3d printed inserts
- 1150 rpm intake motor powering 4 surgical tubing rollers attached with 3d printed holders

Rotary Mechanism

	Free Speed (RPM)	Stall Torque (N*m)	Stall Current (Amp)	Free Current (Amp)
BAG Motor	50.4	3.334261	8	1.8

# Motors per Gearbox	Gearbox Efficiency		Arm Load (lbs)	Arm Length (in)
2	85%		2	8

Driving Gear	Driven Gear		Arm Rotational Speed	Arm Time to move 90-degrees
1	1	No Load:	302.4 deg/s	0.30 sec
1	1	Loaded:	206.0 deg/s	0.44 sec
1	1			
1	1			
1.00 : 1	<-- Overall Ratio		Current Draw per Motor (loaded)	Stall Load
			3.48 amps	6.27 lbs



Problem: Misalignments due to plasma cutter tolerances led to compounding friction in the linear slides.

Solution: Implement mechanical linkage at the bottom to ensure symmetrical slides, and recut the center plates with our sponsor's water jet addressing misalignment issues and minimizing friction.

Key Features:

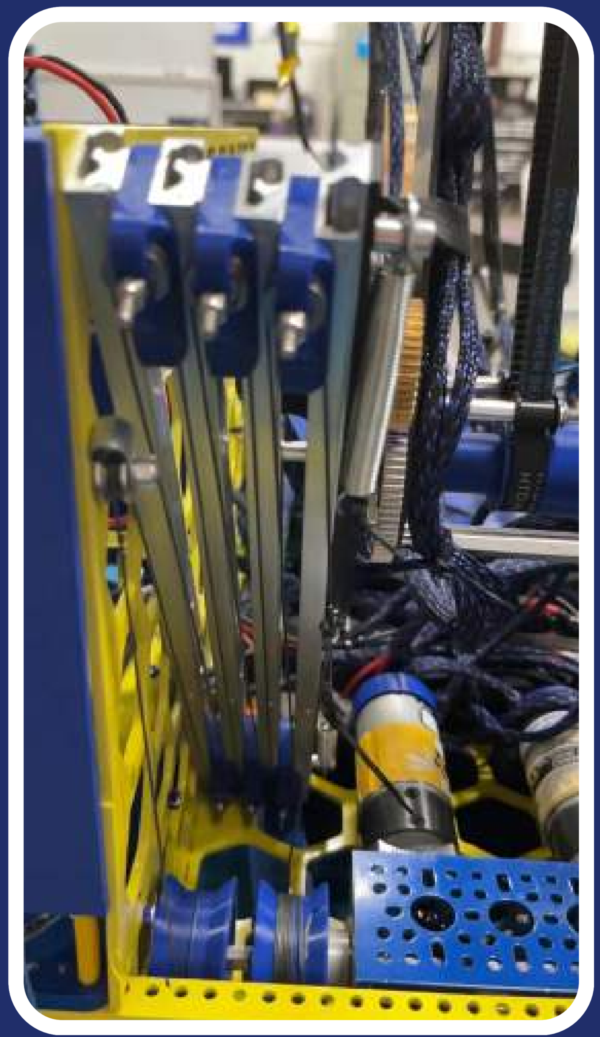
- The inclusion of counter springing to guarantee perfect tensioning.
- Integration of a retraction string for swift downward movements of the slides.
- Achieving full extension in less than 1 second, enhancing efficiency in robot movements.

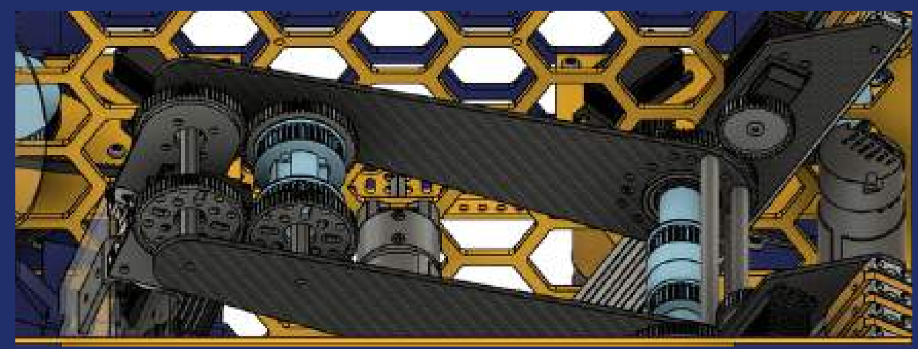
Problem: Wires faced issues of getting entangled under the slides or caught on the arm when operated.

Solution: Assigned rookies the responsibility of devising a scissor lift design specifically to secure wire bundles, preventing interference with the pass-through arm.

Key Features:

- Ensures wires are kept clear of the pass-through arm, eliminating potential entanglements.
- Securely fastens wires to the slides, maintaining a streamlined and unobstructed robot operation.





Brainstorming: We explored various arm styles through sketches, aiming for an optimal design.

Prototyping: To maximize speed, arms were cut from lightweight carbon fiber, and 3D-printed belts were utilized to achieve a precise fit.

Testing: Six different arm versions were cut to identify the best fit, emphasizing the importance of flexibility and adaptability.

Iteration 1: The arm was geared for torque, and a virtual 4-bar mechanism was introduced to align the claw with the backboard angle, and ensuring flatness during intaking.

Iteration 4: To address servo limitations, a switch to a 1:1 ratio was made, accompanied by making the arm thinner and reducing the distance between arms to bolster rigidity.

10179 Tech Turtles
Claw & Climb

Version 1:

Problem: we needed to grab pixels stored in a side by side orientation and be able to place 1 pixel at a time

Solution: Linkage based gripper pushes the inside of the pixels against a small tab in between the pixels

Key Features:

- Able to release pixels 1 at a time
- Over center linkage prevents pixels from being able to release
- Full retraction allows the pixels to fall freely

Weakness:

- Difficult to get aligned properly
- Cannot grab pixels stored in a front to back orientation

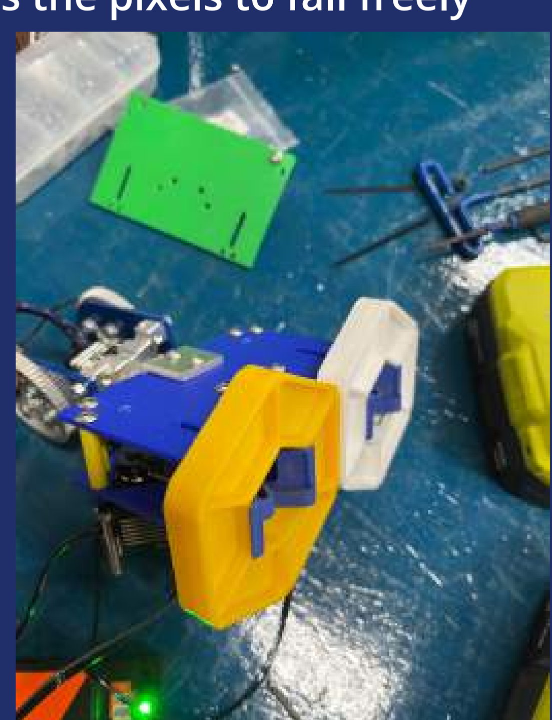
Version 2:

Problem: Geared arm gripper designs caused inconsistency in grabbing and depositing reliability and other linkage systems don’t allow single pixel placement when grabbed in front to back orientation

Solution: Innovative slot based gripper mechanism allows for a much more rigid inside grab

Key Features:

- Over center linkage locks pixels in place
- Self-Aligning as the fingers extend out and grab
- Full retraction allows the pixels to fall freely



Brainstorming: Explored diverse climb devices for deploying hooks onto poles, calculating ideal motor RPM and spool size to match the robot's weight.

Prototyping: Utilized 3D printing to prototype a scissor lift, experimenting with various hooks and types of string to determine the optimal configuration.

Testing: Conducted standalone tests on the motor and scissor lift while the robot was still in the design phase. Swiftly integrated the mechanism into the robot once it proved functional.

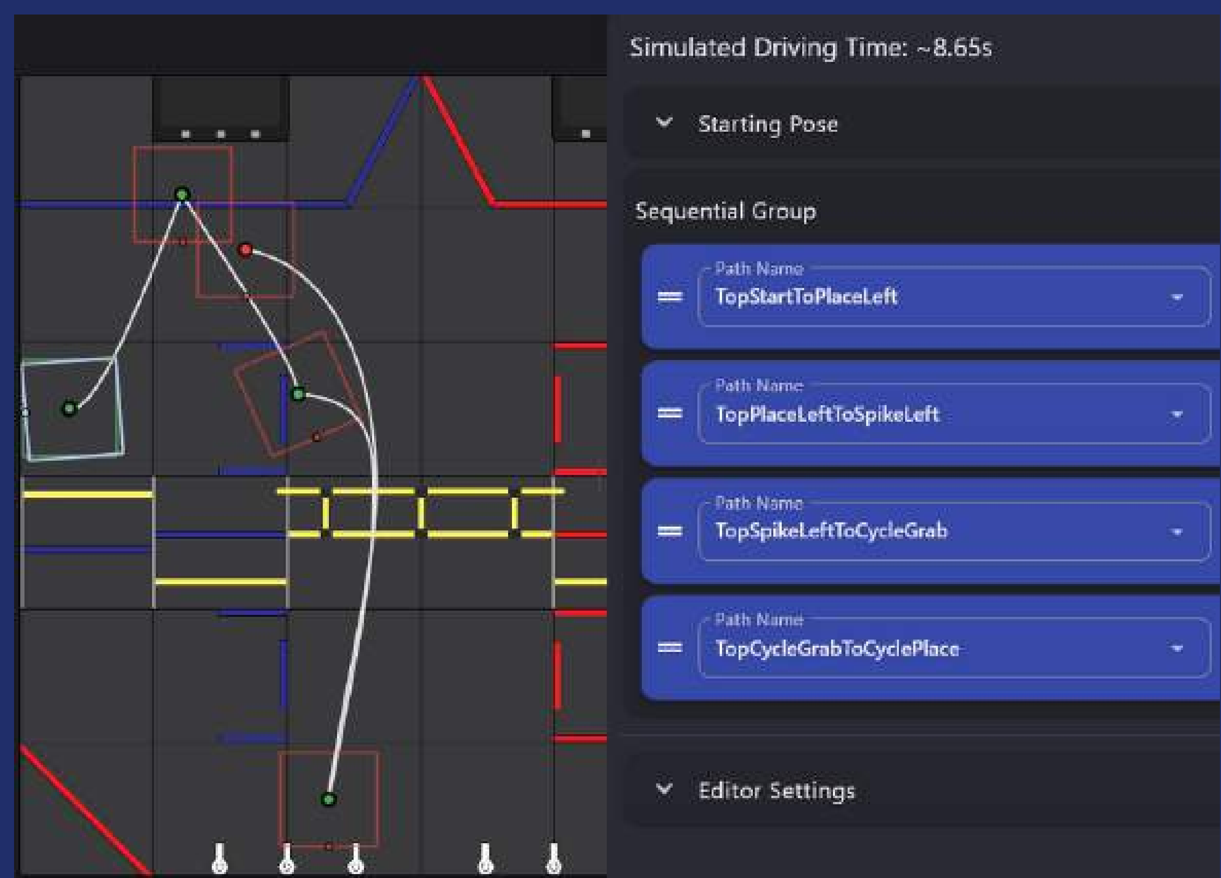
Iteration 1: Introduced a worm gear kit for the climb mechanism to prevent motor backspin when unpowered. Shifted to aluminum for enhanced rigidity.

Weakness

Inconsistent deployment during endgame

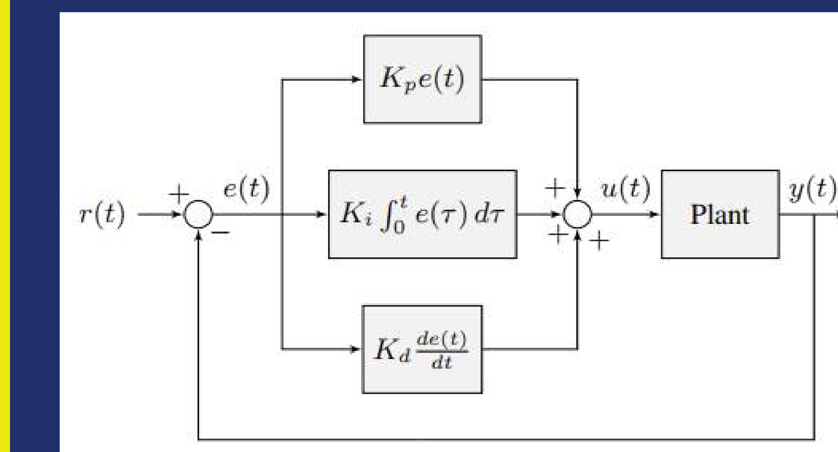
Iteration 2: Decreased motor RPM but significantly increased pulley size to boost climb speed. Addressed issues with the scissor lift deployment, ensuring it no longer relied on shaking the entire robot.

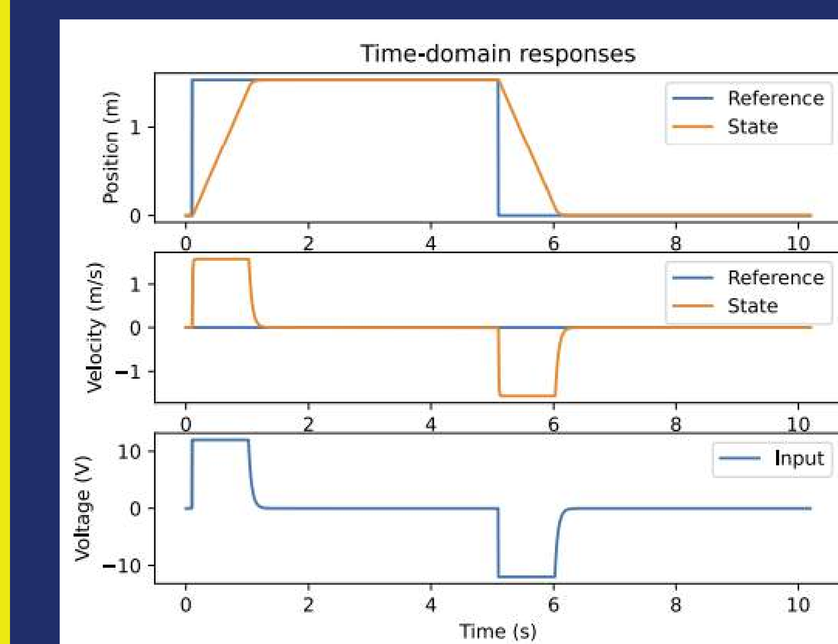
10179 Tech Turtles
Software - Control



FTC PathPlanner

We adapted a specialized FRC path planner for use in FTC, simplifying path creation through an intuitive click-and-drag GUI or coordinate adjustments. Our version facilitates quick path exporting, allowing alterations without re-downloading robot code for instant testing. Recognizing the limitations of RoadRunner for swerve support, we opted for a well-established library designed specifically for swerve drive systems.





PIDF Control

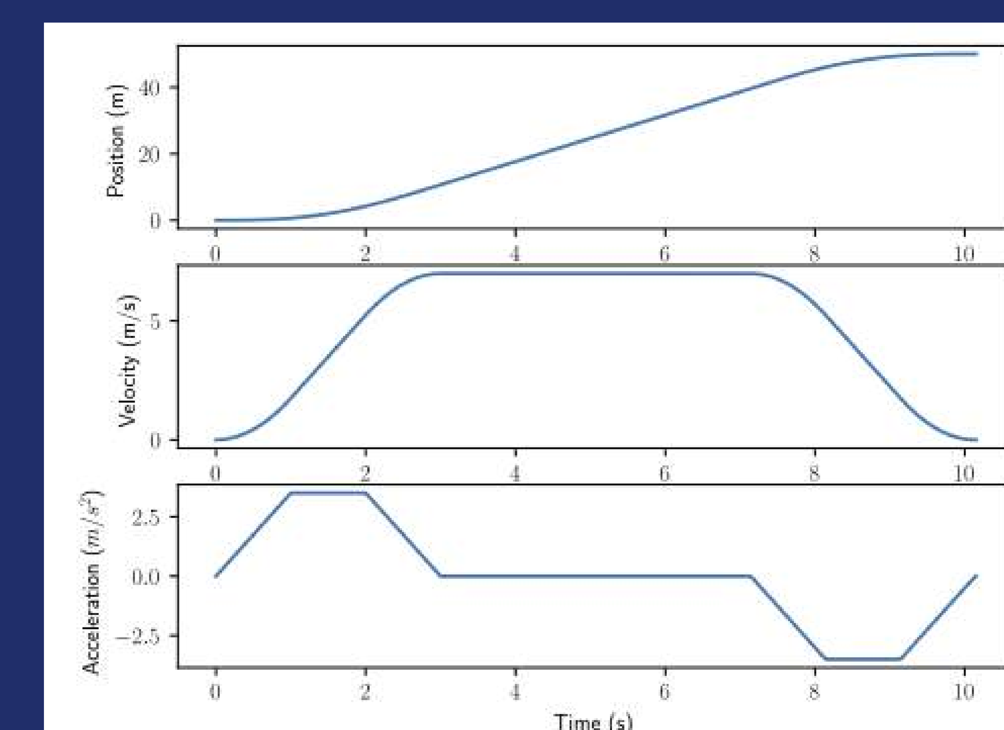
Implemented PIDF control for precise and seamless motion control of our slides and swerve modules. The Proportional, Integral, and Derivative controllers offer feedback on position, calculating optimal power to minimize error from the target. Leveraging absolute encoder data from swerve module servos, we ensure consistent position maintenance despite external forces like friction and centrifugal force.

Finite StateMachine

Utilizing a tailored finite state machine (FSM) for our autonomous mode, we achieved extensive customizability and adaptive states responsive to sensor inputs. This design enables automatic cycling on white pixel stacks until the calculated time for a cycle is insufficient. In another scenario, the robot adjusts by grabbing just one pixel from the stack, triggering a return to attempt another acquisition, showcasing the FSM's dynamic response capabilities.

Motion Profiles

We implement S-curve motion profiles for both the pass-through arm and linear slides. These profiles ensure gradual acceleration and deceleration, resulting in fluid movements. This enhances driver control precision and minimizes abrupt jerks in the mechanisms, contributing to smoother overall operation.



Driver Enhancements

The FSM extends its functionality into Tele-Op, streamlining various actions. This includes the slides maintaining positions, executing automated pixel grabs from the transfer, and elevating the arm with a single button press. Additionally, the FSM facilitates precise adjustments by utilizing the PS5 controller touchpad to control wrist angle. Notably, the system allows seamless rotation of the drive train to achieve optimal alignment perpendicular to the backboard.

Prediction

$$\hat{x}_k^- = A\hat{x}_{k-1} + Bu_k$$

$$P_k^- = AP_{k-1}A^T + Q$$

Update

$$K_k = \frac{P_k^- C^T}{CP_k^- C^T + R}$$

$$\hat{x}_k = \hat{x}_k^- + K_k(y_k - C\hat{x}_k^-)$$

$$P_k = (I - K_k C)P_k^-$$

Kalman Filter

We employ a Kalman filter to merge information from our odometry modules and data obtained from webcam-detected April tags. Since odometry modules update more frequently than the camera, relying on just one source introduces latency errors. The Kalman filter addresses this by assigning confidence levels to each sensor, reducing noise in April tag data, and enhancing odometry accuracy.

Software - Vision

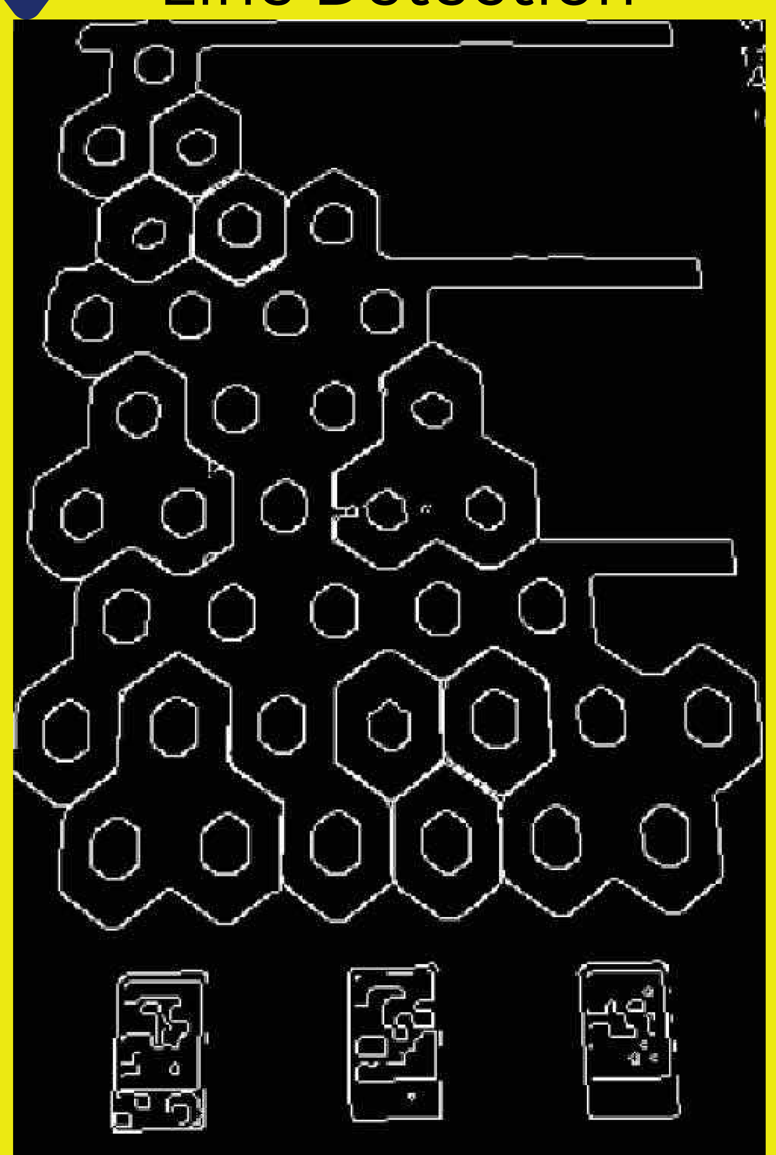
Base Image

Webcam image with no transformations

Hough Circle Detection

Circle detection, very error-prone with lighting

Line Detection



OpenCV line detection for all pixel colors. Very error-prone with mis-aligned pixels.

Hexagon Detection

Custom hexagon detection based off of line size, connections, and center area.

Autonomous Pixel Placement

From the beginning of the season we have worked towards creating a completely autonomous method of placing pixels in their optimal spot on the back board. Although it is not yet robust enough to be used by drivers during a match, the following paragraphs describe our approach.

The pixel detection process involves using OpenCV and the yCrCb color space to identify hexagonal pieces on a blackboard. Contours are extracted from the binary image, and connected component analysis is performed to separate individual hexagons. To address merging issues, a filtering process is applied to detect and remove invalid contours.

After contour detection, the perspective of the image is transformed to a consistent view using an AprilTag placed on the blackboard. This transformation allows for a standardized coordinate system, crucial for subsequent analysis.

To determine the optimal placement of hexagons, a weighted algorithm is proposed. Hexagons are associated with positions in a 2D array (pixelMap), and the algorithm considers both position and color. The goal is to find the most suitable location for placing hexagons based on predefined criteria, such as avoiding floating hexagons and ensuring support from lower layers.

This comprehensive approach combines contour detection, perspective transformation, and a weighted algorithm for intelligent placement of hexagonal pieces. The integration of computer vision, image processing, and algorithmic logic creates a robust system for automated manipulation and arrangement of hexagons on the blackboard.

New Members

This year we recruited 5 new team members ranging from 6th grade to 10th grade by advertising in schools, at STEM camps, and by inviting the younger siblings of FRC team 2556 members. Students were encouraged to attend our open houses to get a taste of FTC and from there we were able to recruit them to our team. This provides a strong foundation of members for many more years and allows us to expand our impact on the community.

Training

We implemented a mentoring program, allowing new members to shadow experienced team members. Through this mentorship initiative, new members gain exposure to the various facets of the team's operations, fostering skill development and a deeper understanding of the team's objectives. This hands-on approach allows for integration into team dynamics, ensuring meaningful contributions throughout the season.

Funding

We use a tier system for sponsor to incentivize larger donations. The more they donate the more perks they get such as a logo on the shirts or on the robot. We maintained ASEI as a platinum sponsor and added 3 new platinum sponsors: Fort Walton Machining, Talking Parents, and Bit Wizards. In addition to sponsorships we did several fundraisers including a Norwex cleaning supplies fundraiser.

TEAM 10179 BUDGET 2023-2024

Item Description	Estimated Cost	Actual Cost
FIRST registration	$300	$295.00
Robot Part / Supplies	$5,000	$6,879.00
Field Set up / Field parts	$600	$555.00
Control & Communication Set	$300	$0.00
REV Control Hub & Expansion Hub	$500	$273.00
Tools	$200	$131.00
Team Supplies	$500	$481.00
Storage Locker	$500	$386.00
Printing/Ink	$80	$0.00
T-Shirts	$1,000	$503.00
Signs	$200	$60.00
League FTC Dues	$350	$325.00
Tournament Registration/Training	$400	$0.00
Hotel	$5,000	$0.00
Gas	$1,000	$134.00
Lunches/Snacks	$500	$305.00
Team Buttons	$80	$0.00
Total	$16,510	$10,327.00

Item Description	Estimated Funds	Actual Funds
Money left from last year		**$1,923.00**
Grants	**$1,000**	$330.00
Fundraisers		$184.00
Sponsorship	**$6,000**	
Applied Systems Engineering Inc.	$3,000	$3,001.00
Bit Wizards		$3,001.00
Talking Parents		$3,001.00
White Willson		$500.00
Family & Friends		$440.00
	Total	$12,380.00

Connect

Fort Walton Machining

We reached out to Fort Walton Machining for help manufacturing our swerve drive system. Not only were they willing to help us produce the parts they were happy to review the design with us, explain manufacturing drawings, tolerances, show us the process behind making parts, and provide a tour of their incredible facility. We maintain contact with FWM and they maintain the offer to help us make any parts we need.

ASEI

ASEI has been a sponsor of our team for several years; however, this year they have helped us tremendously with some of the manufacturing of our robot as they have a waterjet. They are able to cut carbon fiber plates on their waterjet which we have been able to use to make strong lightweight parts. In addition to providing us with parts they have offered design advice with the robot and have given advice about how to make our designs strong enough to last. Besides the robot ASEI also has provided insight on the engineering world and has helped team members be prepared.

ASEI
Applied Systems Engineering Inc

Other Teams

New Mentors

Open Houses

We hosted 2 open houses encouraging students of all ages to come out and learn about FIRST Robotics. We gave presentations on how FTC works, how we as a team function, how students can join our team, how our previous season went, and how starting a new team works. Additionally, we had engaging activities set up for students ranging from an opportunity to drive our robot to engaging build challenges to give students a taste of FTC. From this we gained 5 new team members, introduced dozens of students to FIRST, and were able to help start team 23313 Emerald Phoenix!

Starting a New Team!

Following our open house the coaches of team Emerald Phoenix reached out to us asking about how to start a team. They learned about FIRST through our open house and wanted to give it a shot! We provided them with multiple Actobotics Robot kits, roughly 20 motors, and any parts that we thought could be helpful for a new team trying to build a robot. In addition to parts, we gave them resources on how to start a new team and helped them with any questions and problems that arose.

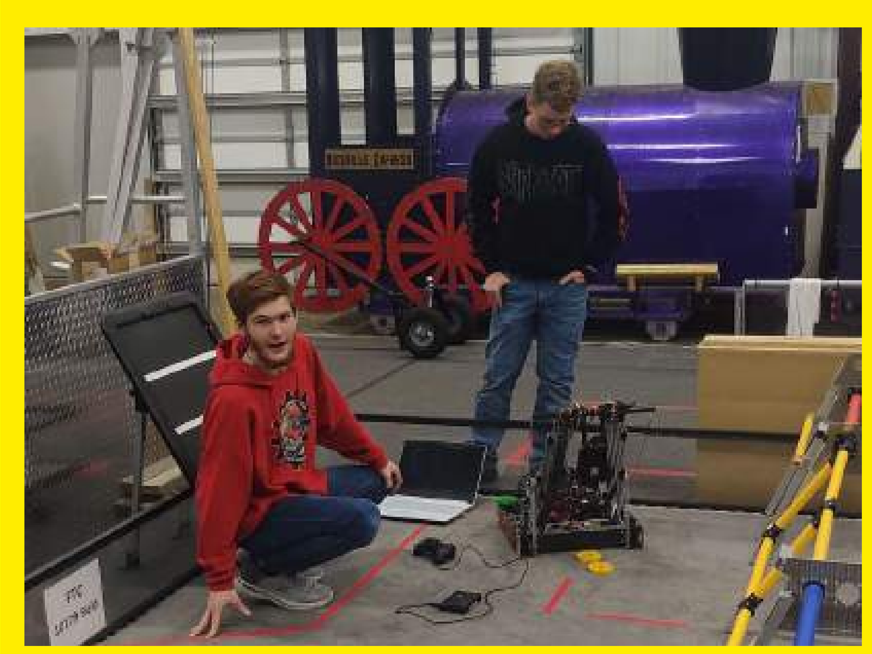
University of Florida - Robot in 3 Days

One of our members was able to take a trip down to Gainesville right after kickoff to assist with the University of Florida - Robot in 3 Days. Robot in 3 Days or RI3D is a challenge done by teams and Alumni to build a competitive robot in 3 days with the hopes of being able to provide ideas and inspiration to other teams early in the season. The UF team consisted of alumni and members from world's winning team, Team 14725 - Java the Hutts, Team 18317 - Steel Eels, and more. Every minute that we worked was livestreamed to teams so they could see our thought process live and ask any questions about what we were doing. The final release video has over 12k views and has been an inspiration for many teams.

Brody

Work Days

We invite teams to come in and use our full field setup, use our wide variety of machines, and receive help from us. Team 14707 - Zero Logic, has came on multiple occasions to machine parts, tune autonomous, and run some driver practice. We invite all teams to come and are confident that the teams that have come have seen huge benefits.



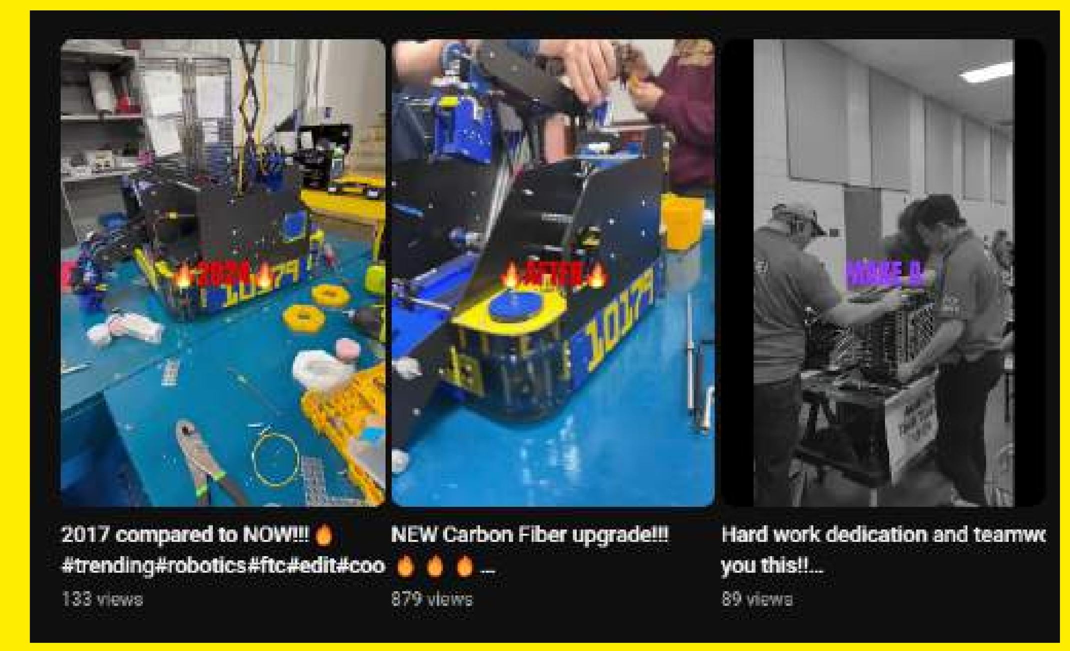
10179 Tech Turtles Community Engagement

NERF Cleanup

Before FRC season started we wanted to give back to Mr. Neiger by cleaning up the property and doing some landscaping. We rounded our team up and invited any FRC members who wanted to help with the process. We dealt with all the old rotting wood, cleaned up the trash around the property, trimmed all the plants, and reorganized the shed. This was both a way to give thanks to Mr. Neiger for providing the incredible build space we have and a way to help FRC team 2556 whom we share the space with.

Youtube Channel

While we already had a Youtube channel it has been several years since we have posted on it. One of our new members, Wes, makes Youtube videos at home as a hobby and expressed that he would like to take a shot at revitalizing the channel. He has made 3 videos for the team so far and has reached around 1,000 people through these videos.



Volunteering

Our members volunteer at a wide variety of events in our community. One prominent event we helped with was FRC team 2556's STEAM Carnival. The carnival consisted of a bunch of booths with STEAM related activities setup for kids to do providing both entertainment and learning. Our members helped setup, run, and take down the event allowing hundreds of students to experience both STEAM and FIRST robotics for the first time.

Jackson

Other Social Media

In addition to our Youtube channel we decided this year to make both a team Facebook and team Instagram so that we can share what we do with the community and sponsor Some extra benefits of this is that our sponsors get to see where the money they donate is going and we now have sites to direct people interested in our team to.