FIRST TECH CHALLENGE

DECODE

PRESENTED BY RTX

ALPHAS

ENGINEERING THE FUTURE

19343

ALPHAS

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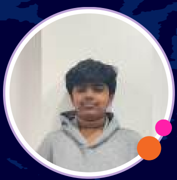
ENGINEERING THE FUTURE


Abhishek

Rithik

Sahas

Shrinand

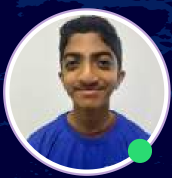
Ishita

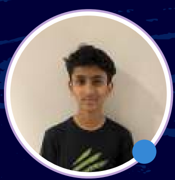
Anuj

Vedansh

Atiksh

Raj

Tia

SriKrishna

Vihaan

Shloak

Ayan

"Engineers like to solve problems. If there are no problems handily available, they will create their own problems." — Scott Adams

Build · CAD · Programming · Outreach · Marketing & Social Media · Co-Captain · Captain · Drive Team

Our Journey

"Scientists study the world as it is; engineers create the world that has never been." — Theodore von Kármán

Team 19343 is a student-driven robotics team founded in the 2021–22 season, built on curiosity, teamwork, and continuous improvement. Over the years, the team has evolved from learning core FTC fundamentals to delivering strong engineering solutions, impactful outreach, and confident leadership.

Each season reflects growth not just in robot performance, but in collaboration, innovation and community engagement within the FIRST Challenge framework.

Summary

From its inception, Team 19343 has emphasized learning through iteration and growth through reflection. Each award marks a **milestone** in the team's development, balancing technical excellence with outreach and leadership. The team's journey reflects resilience, adaptability, and a commitment to improving both their robot and themselves every season.

Awards

- 2021–22 Season: Team 19343 founded; focused on learning, experimentation, and building a strong foundation
- Following Seasons: Finalist Alliance Award; 1st Place Connect Award for outreach and partnerships
- 2024–25 Season: Innovate Award for engineering design and iteration
- FTC Worlds: Teammate selected for Dean's List Award

INTO THE DEEP
PRESENTED BY RTX
CENTERSTAGE

Objectives

1. Inspire children of all backgrounds to pursue STEM careers by sharing passion.
2. Build a cohesive team built on the respect, communication, creativity and commitment of all members.
3. To develop leadership, communication and teamwork skills among all members.
4. To represent the value of FIRST by competing with professionalism, integrity and inclusivity.

We at Team Alphas ensure that there are mixed age groups of team members (ranging from grade 7 to 12) to ensure a five-level pass down of knowledge, supporting the team, even when fundamental members leave. This helps the seniors practice leadership skills and the juniors gain knowledge.

Alumni

What happens to a team member after they finish high school? They become an alumni, or a FIRST volunteer. In DECODE, Alphas alumni actively engaged in supporting the team, organizing training workshops, and emphasizing the consolidation of a harmonious team. Through the contacts obtained thanks to them, we connected with individuals specialized in both technical and non-technical fields.

Gracious Professionalism

The longevity of the team is one of the most important aspects of our philosophy. The flow of knowledge must be passed from one generation to the next, consistently maintaining the spirit of Gracious Professionalism.

Financial Sustainability

A tiered sponsorship model combined with student-led fundraising initiatives ensures stable financial support while developing organizational and communication skills within the team.

Knowledge Preservation

We maintain a centralized digital archive containing build logs, documented code, wiring diagrams, and season reflections. This system ensures that technical knowledge and lessons learned are preserved beyond a single season, allowing future members to build upon previous work efficiently.

SWOT Analysis

Strengths

Our Team's greatest strength is that we have a team with varied skillsets. The varied skillsets of teammates help us balance out our build, code and CAD evenly

Weaknesses

Our team's biggest mistake resides in our communication. Our team lacks in communication skills, making it difficult to coordinate and finish work on time.

Opportunities

By improving communication and role clarity, our team can better use our diverse skills. Using planning tools and regular check-ins will help us work more efficiently and meet deadlines.

Threats

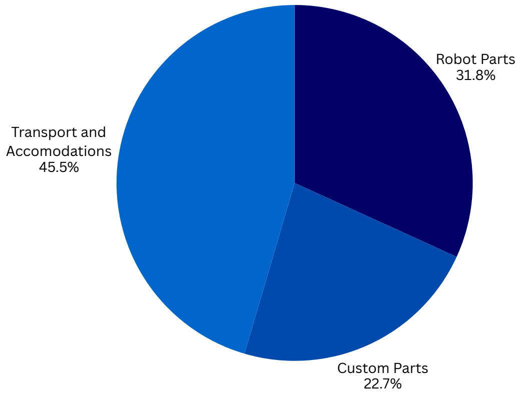
Our team's main threat is time-constraints. Due to our lack of communication, coordinating the team and finishing work on time is a challenge

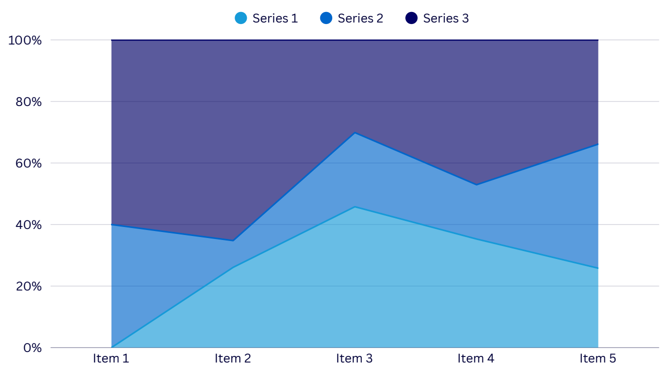
Business Model

Media Coverage:

As a team, we have worked very hard to build our personal brand, which helps us get donations for the team. To do this we have set up our own social media page, and we were recently hosted on a local Telegu news network. We also host frequent events like a scrimmage match with other team in Hyderabad.

Statistics





How we raised

Rs. 5,00,000

Sponsorship Docket

We have tried approaching sponsors by meeting them directly. For approaching sponsors via email or other forms of contact we have created a personalized sponsorship docket. The sponsorship docket has the team presentation, sponsorship tiers, benefits and the purpose for requested funds stated clearly.

Fundraising

To support our season goals, Team Alphas raised funds through sponsorships, partnerships, and outreach-based fundraising efforts. We approached sponsors with a clear proposal explaining our mission, impact, and how their support would be utilized. These efforts allowed us to secure funding while building long-term relationships with organizations that support STEM education.

Objectives

We understand that our performance is impacted by acquiring sufficient funds and also by efficient management of financial resources. Funding is essential for teams to innovate, compete and grow. It supports high-quality robot components, advanced technology and software ensuring optimal performance. Strong financial support fosters creativity and problem-solving

Planning

Team Alphas planned its finances by identifying essential expenses such as robot parts, registration fees, outreach activities, and travel. We created a season-wise budget to track spending and ensure funds were used efficiently. This planning helped us prioritize resources, avoid unnecessary expenses, and stay financially prepared throughout the season.

OUR SPONSORS

KSP
GRIFFIN INFRATECH
RADHA TMT
The DNA of a stronger nation
TECHNIC EDUCATION
BLUBOY
Green Energy Solutions.... for a greener tomorrow.

THE GOA INTERNATIONAL ROBOTICS FESTIVAL'24 · FIRST LEGO LEAGUE GREECE · FIRST AUSTRALIA

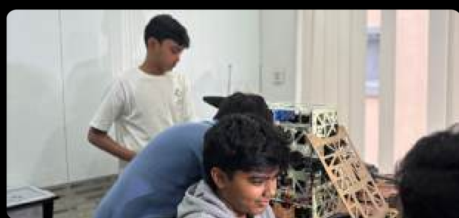
Our History

Team Alphas was formed by a group of students who shared a strong interest in **robotics**, **engineering**, and **problem-solving.** From our first season, we focused on learning the **fundamentals** of the **FIRST TECH CHALLENGE**, including robot design, programming basics, and **teamwork**.

Our early work involved experimenting with **simple mechanisms**, **understanding** competition rules, and **learning** from mistakes. Through every season, we gained **experience**, improved our technical abilities, and became more **confident** in applying **engineering** concepts. These experiences helped shape our **identity** as a team that **values** learning, persistence, and **continuous improvement**.

Organisational Growth

As Team Alphas **progressed**, we developed a more **organized** and **structured** team system. Members were assigned **clear** roles in mechanical design, programming, outreach, and documentation to improve **efficiency**. We introduced **regular** planning meetings, build schedules, and reflection sessions to track **progress** and **identify** areas for **improvement**. Senior members took responsibility for **mentoring** newer students, ensuring **skills** and **knowledge** were passed on within the team. This **organizational** growth **strengthened** our **teamwork**, improved **communication**, and allowed us to **balance** both technical development and community outreach **effectively**.



Connect

Over the past year, Team Alphas built strong connections within the local FIRST and STEM community through collaborations with industries and institutions. These interactions helped us learn from professionals, gain mentorship, and share our passion for robotics with students.

KIMS Hospitals

Team Alphas visited KIMS Hospital to understand how technology supports modern healthcare systems through automation and data-driven processes. By interacting with professionals, we learned how precision equipment, reliability and efficiency play a critical role in patient care and hospital operations, helping us appreciate the responsibility engineers carry in real-life applications.

Nala Robotics

At **Nala Robotics**, we collaborated with industry **specialists** to explore **industrial** robotics and automation systems.
We **observed** robotic arms, control mechanisms, and **optimized** workflows used in manufacturing. This experience **helped** us connect **FTC** design principles with real-world **applications**, **influencing** how we approach robustness, iteration, and long-term **sustainability** in our robot **designs**.

Warner Bros

Two officials from Warner Bros visited Team Alphas at Technic Education.

Shriram Universal

Team Alphas visited The Shri Ram Universal school to host a session where they taught about Mechatronics and explained about their bot and explained about STEM and FIRST to 250+ studTeam Alphas visited The Shri Ram Universal school to host a session where they taught about Mechatronics and explained about their bot and explained about STEM and FIRST to 250+ students inspiring students to learn STEM and understand Mechatronics along with basics of build design and codeents inspiring students to learn STEM and understand Mechatronics along with basics of build design and code

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Keerthi Industries

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AMD

Team Alphas connected with AMD Ryzen to understand how processors drive modern computing through performance-focused architecture, interacting with professionals, we learned how efficiency, optimization and reliability shape real-world engineering and FTC design decisions. They also gained insight into how industry-level constraints like power management and thermal design influence product development.

Collin's Aerospace

Team Alphas engaged with Collins-Aerospace to explore how aerospace innovation translates real-world engineering into FTC design and STEM learning. Through discussions with industry professionals, we learned how precision, safety, and systems integration drive aerospace advancements and influence problem-solving in robotics. We gained insight into how rigorous testing, redundancy planning, and risk assessment ensure mission reliability in high-stakes environments. The interaction helped us understand the importance of collaboration and high stakes

My Home Avatar

Team alphas had an outreach program named Introductory session on robotics at a community called My Home Avatar which is a home to almost 10,000 residents. The goal was to inspire as many young minds as possible so that it even meets their sustainability goal of having a continuous stream of kids coming into FTC as older kids leave.

Tech Mahindra

Team Alphas had a meeting with Mahindra University where they taught Team Alphas about Mechatronics and robotics Where Team Alphas showcased their bot to Mahindra University And took Feedback they told them about FIRST and FTC

Motivate

Mentored 2 Teams

Over the past year, Team Alphas strengthened its presence within the local FIRST and STEM community through meaningful collaborations with industries and institutions. These interactions allowed us to learn from professionals, receive valuable mentorship, and exchange technical knowledge. We also shared our passion for robotics by engaging and inspiring students. Through outreach, we reinforced our commitment to learning and leadership. Our outreach activities might be less but they were very impactful. Our outreach at Oakridge school last season helped form a new FTC team - Team Araxys while our outreach at Akshay-Akruthi led to the formation of Team Avengers Army.

Team Avengers Army

As a part of outreach and training, Team Alphas supported Ashray-Akruti, a school for individuals with disabilities. Akshay-Akruthi is a school for induviduals with disablilties, especially focussing on the hearing and speech impaired. Team Alphas has helped them in launching their FIRST Tech Challenge team - Avengers Army. We guided students through the basics of robotics, teamwork, competition structure and driver practice. This collaboration empowered them to explore engineering with confidence and inclusivity. It reinforced our belief that STEM should be accessible to everyone.

Team Araxys

Team Alphas inspired a large number of students during their outreach activities with Oakridge School last season. Through interactive sessions, demonstrations, and discussions about robotics and FIRST values, they sparked strong interest among students in participating in the FIRST Tech Challenge (FTC). As a result of this growing enthusiasm, many Oakridge students expressed a desire to join FTC. To accommodate the increased interest and ensure effective participation and learning, Team Alphas expanded their team and made the strategic decision to divide into two teams. The original team continued as Team Alphas, while the newly formed team was named Team Araxys. Throughout the year, Team Alphas worked closely with Team Araxys, collaborating with them and providing continuous mentorship during the design, building, and problem-solving phases of the robot development process. They shared technical knowledge, guided decision-making, and supported the team through challenges, ensuring a positive and educational experience. This collaboration strongly reflected the FIRST core value of Gracious Professionalism, as Team Alphas balanced competition with cooperation, learning, and mutual respect

LUPUS

ENGINEERING PROCESS

1. Brainstorming

At the start of the season we thought of using a turret and a shooter with a hood for our outtake .

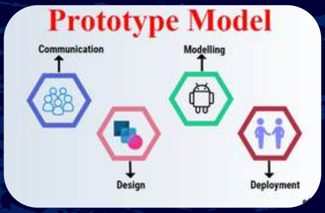
2. CAD Design

To design the robot, we used Fusion 360. This is a useful app because it is very precise when making designs, and it is the industry standard. It is simple to learn and has a good UI, making it easier to design the robot.

FUS

3. Prototyping

We used quick prototyping to test out early concepts and experiment with various designs.



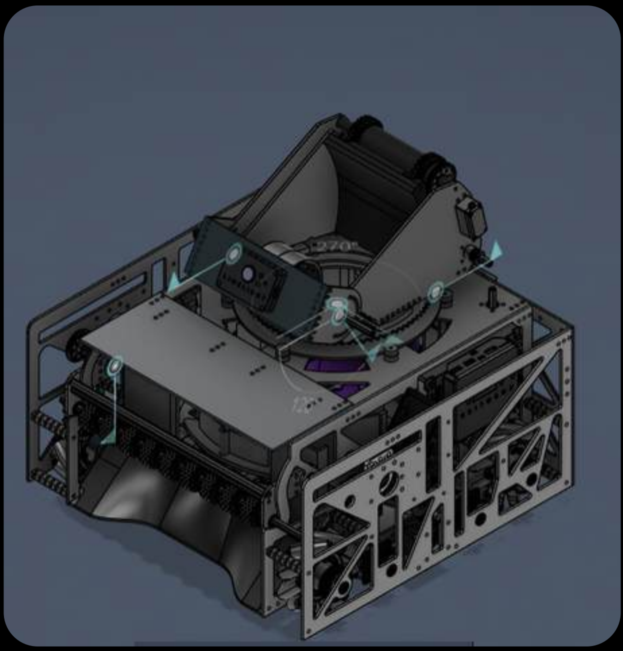
For example. the robot we intially designed could lift the base high so another bot could be under it, but this didn't work well, so we changed the design.

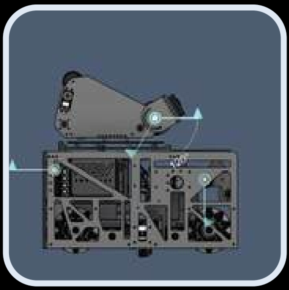
4. Parameters for analysis

One example of this is that we analzyed the compression of the balls, and used this to find the best speed for the shooter.

5. Better efficiency

To further optimize the robot, we added multiple sensors, like color sensors and the Limelight camera to make sure that our bot could track and work well in autonomous and teleop.





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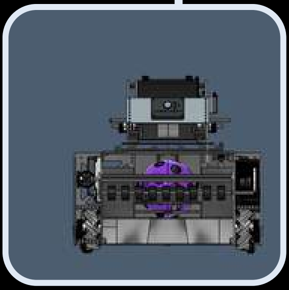

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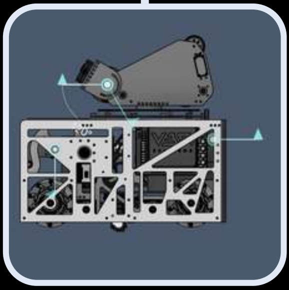

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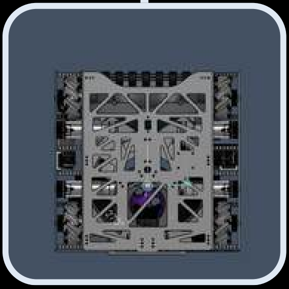

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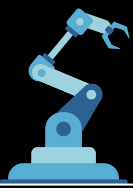


engineer — inspire

ALPHAS ENGINEERING THE FUTURE | TECH CHALLENGE

Chassis

Design Objectives

1 Compact & Constraint-Driven Design

Constraint-driven square chassis with flush-mounted motors and integrated mounts ensured uniform mecanum wheel loading, minimized footprint and mass, eliminated external brackets, and achieved full FTC size compliance with reduced subsystem interference and improved serviceability.

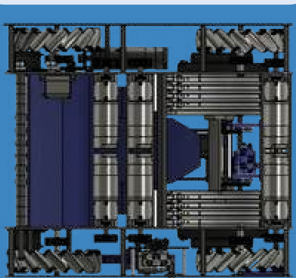
2 Mecanum Drive for Omni-Directional Control

4-wheel mecanum drivetrain enabled full holonomic (X, Y, θ) motion for precise alignment and simplified autonomous paths, with inherent traction losses mitigated through mechanical symmetry and control-level correction.

3 Traction Optimization & Weight Distribution

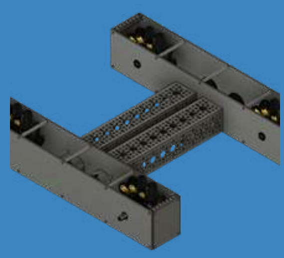
Traction-optimized mass distribution with centralized weight, low center of gravity, and symmetric wheel placement maximized normal force consistency, reducing slip during acceleration and improving strafing reliability and odometry accuracy.

Iteration 1 — Baseline Mecanum Prototype



The initial iteration validated basic mecanum kinematics and frame spacing.

Iteration 1 — Baseline Mecanum Prototype



The initial iteration validated basic mecanum kinematics and frame spacing.

Pros

- High directional flexibility
- Simple frame geometry
- Low build time

Improvements

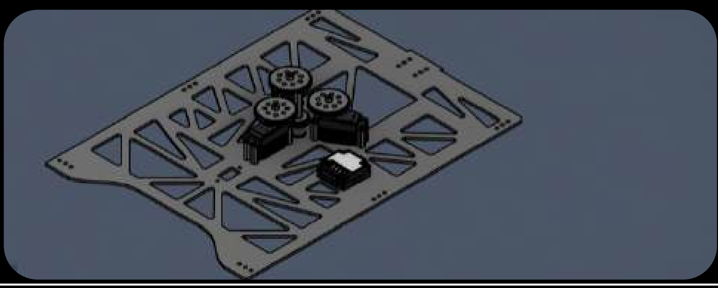
- Reinforced cross members to reduce torsional flex
- Adjusted wheelbase to improve lateral stability

Cons

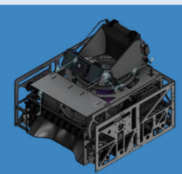
- Uneven wheel loading
- Reduced strafing efficiency
- Noticeable localization drift

Result

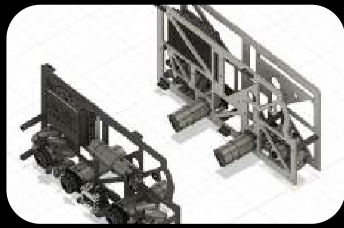
- Increased effective traction
- Reduced energy loss during diagonal motion



Iteration 3 — Final Chassis (Lupus)

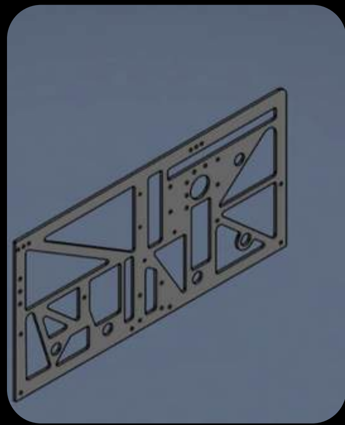


Drivetrain V2



Optimizations

The final chassis integrates structural rigidity, traction efficiency, and modularity.



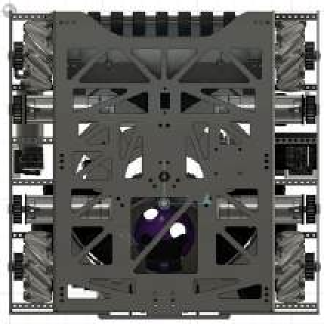
Side plate

Key Features

- Rigid, lightweight frame with optimized cutouts
- Precise wheel alignment for consistent roller contact
- Modular motor mounts for quick replacement
- Optimized spacing for mecanum force vector efficiency

Overview

The Lupus chassis was engineered as a compact, high-precision mecanum drive platform optimized for FTC field constraints. The design emphasizes predictable kinematics, high traction efficiency, and low localization error while remaining within the size limit and a total robot mass of 11–12 kg.



Localization-optimized lightweight chassis

with balanced wheel normal forces, high torsional rigidity, and interference-free cable routing minimized slip and encoder error, while aluminum construction, strategic plate pocketing, and reduced fastener redundancy maintained a 13–14 kg mass budget and improved autonomous repeatability.

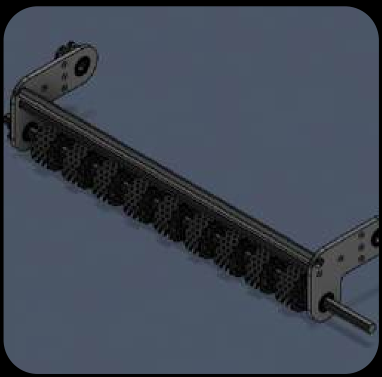
Conclusion

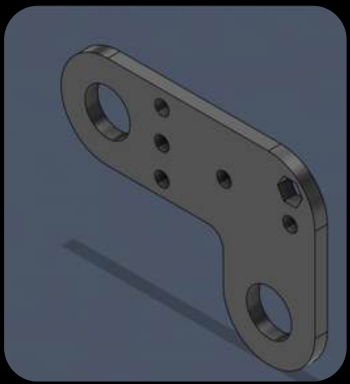
The Lupus chassis demonstrates a design approach driven by mechanical efficiency, FTC constraints, and control accuracy. By iterating on traction, rigidity, and weight distribution, the final mecanum platform provides reliable holonomic motion and serves as a stable foundation for high-level autonomous and tele-operated performance.

INTAKE

For the Intake we decided to use a rolling wheel intake. Our intake is only on the back half of the bot, and it opens directly up into our spindexer. It was mostly 3-d printed, but the shaft on the intake was made from metal.

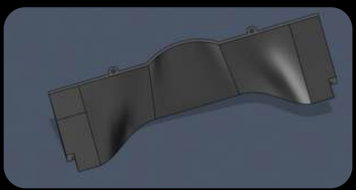
In the intake we also use these pieces, to make the roller move up when a ball is incoming. This free movement makes it much easier to intake the balls easily, because the roller moves along with them. This is a completely mechanical part, meaning that it happens automatically.





To bring the balls up into the intake we utilized a ramp, that allows them to come up in a gradual manner. This ramp was completely designed from Fusion 360 and was printed. The benefits of this is that it is lower weight, but it also is less durable, meaning that after long periods of time using it, it will eventually wear out. After going up the ramp, the balls go into the spindexer.

Underneath the intake, we have a color sensor that detects whether the ball is purple or green which use to shoot the pattern. It also gets the distance, which we then use to make sure that the servo will spin is the distance is low enough.



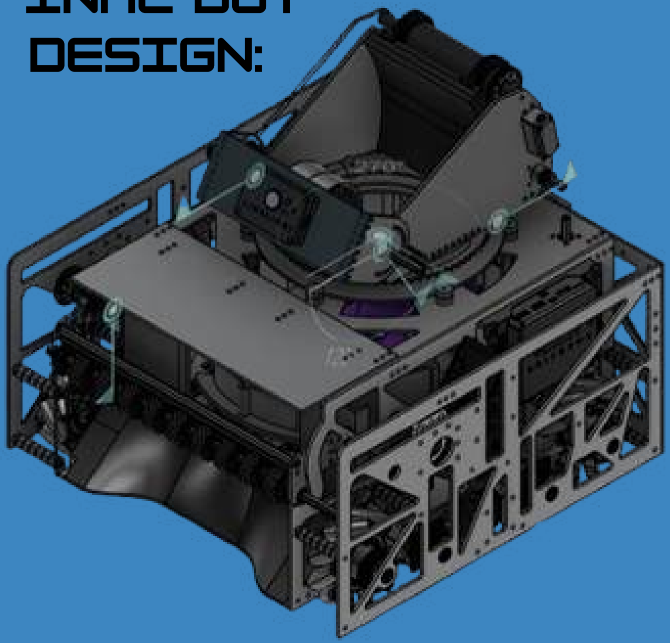
Our intake only uses 1 hardware compenet, which is the intake motor. This means that we are able to save space on our control hub for other components.

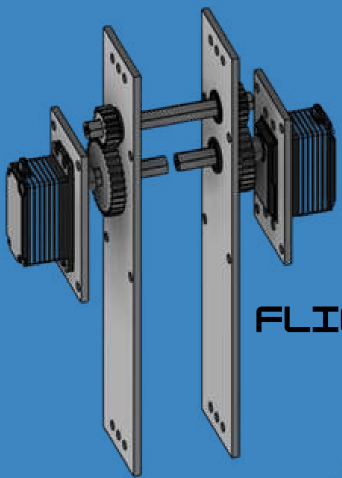
When intially making the intake, we had small ramp that feed directly into the spindexer with only a few rollers. Overtime we made the design better by changing the dimenions of the ramp, and adding more rollers to the intake so that it could take the balls in more easily. We also changed the angle of the ramp, from tests that we made, and fixed it so that only one ball could go up it at once.

DESIGNS

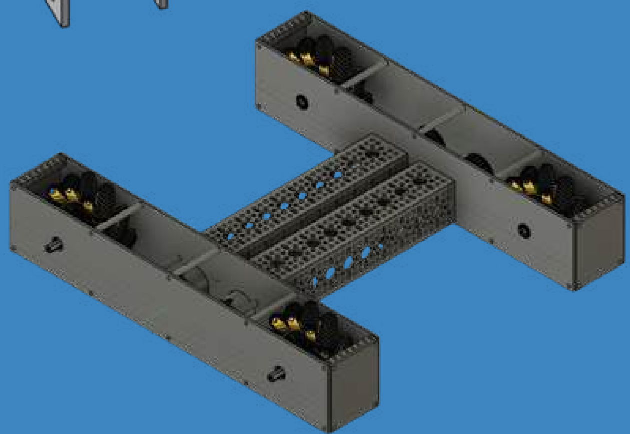
Here are some of the designs we use throughout the robot. Including the drivetrain, flicker, turret, shooter, and much more:

FINAL BOT DESIGN:





FLICKER MECHANISM

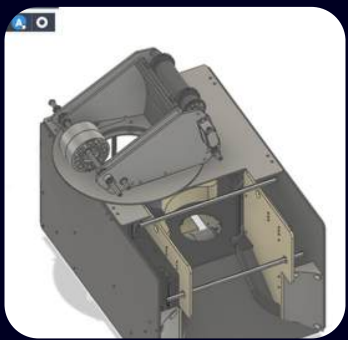


INITIAL DRIVE TRAIN

SHOOTER

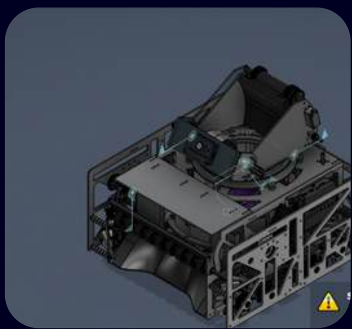
The function of the shooter is get the balls into the goalposts quickly and accurately. For this we use spinning wheels to propel the balls out of the bot and toward the goalpost. The body of our turret was completely 3d printed. The spinning wheels allow us to control both the speed and consistency of each shot, improving accuracy during both autonomous and driver-controlled periods. Using a fully 3D-printed turret body allowed us to rapidly iterate our design, reduce weight, and customize the shooter to fit our robot's layout.

To adjust the angle of the shooter, we used a few 3d printed gears and a servo. We needed to do this because we realized that the angle needed to be higher when shooting from further back



To move the balls from the outtake to the shooter, we use a flicker, which was also a 3-d printed part. This moved the balls up from the spindexer into the shooter. As for the hardware components in this whole system, we used 2 motors for the shooter, 3 for the spindexer, 2 for the flicker, and 1 for the angle of the shooter.

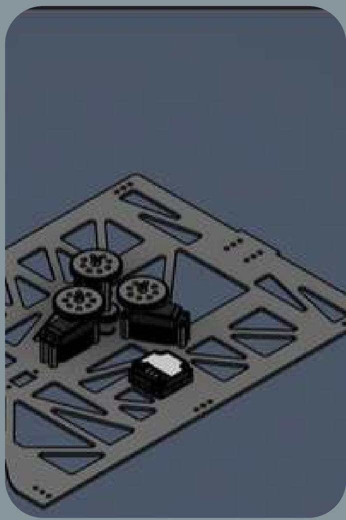
To launch the balls we use a spindexer in the body of the turret, to move the balls from the intake of the bot to the shooter. Initally, this spindexer was curved, but when we realized that the curves were making the ball spin due to the centripetal force, we redesigned the spindexer to stop this, making our shooting more effective and accurate.



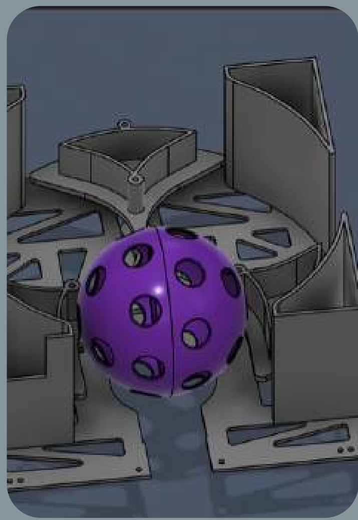
Inital design of spindexer

To make sure that our robot has vision, we added a camera mount onto the shooter. this way the robot could track the april tags, and adjust the position of the turret with a motor. This way it would be easier for our drivers to shoot the balls because they don't have to worry about alining the turret with the goalpost.

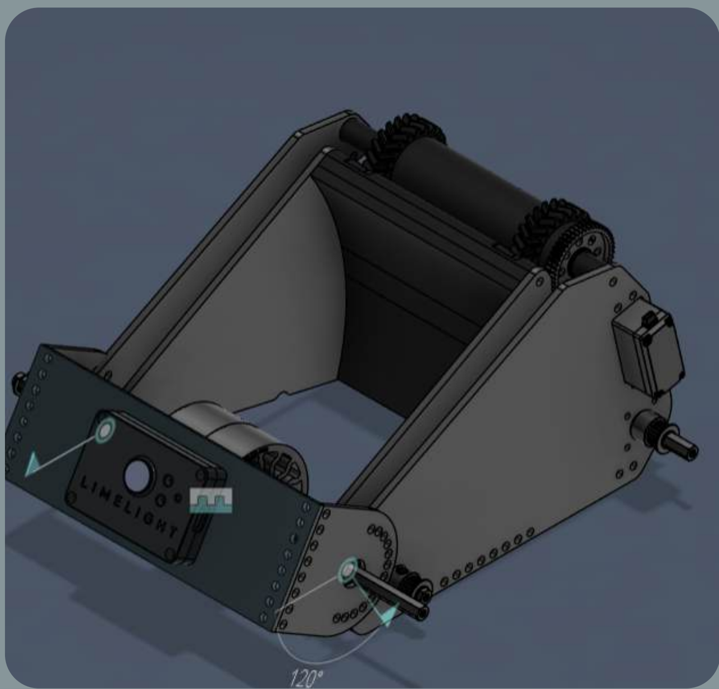
SERVOS IN SPINDEXER:



SPINDEXER:

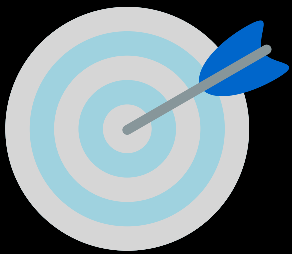


TURRET

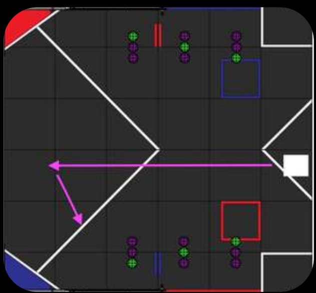


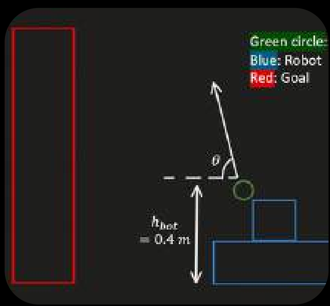
STRATEGY

Our main stratergy for the game was to be flexible for our alliance member. This meant that we needed to be able to shoot from both near the goalpost as well as from further away from the goalpost in both of the launch zone. We also planned to collect more balls from the loading zones so that we would be able avoid all of the congestion of robots within the big launch zone where they would be collecting the inital balls placed during the setup of the field.

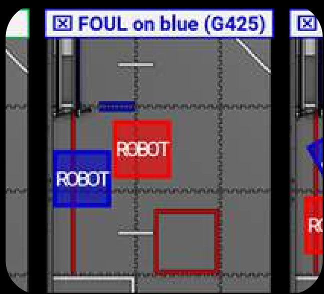


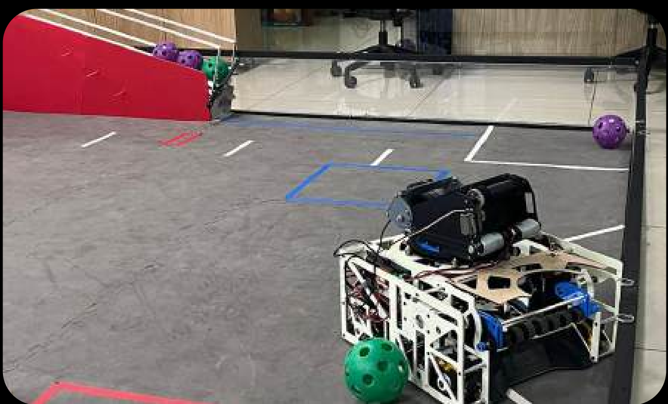
For the last 10-15 seconds of the teleop, we decided to focus on parking rather than just continuing the shooting of the balls. This is because we know that our drivers will be able to park succesfully, and would rather spend time doing that than continuing to score balls, because the successful parking is worth more points. We believe staying adaptable is key to winning.





Furthermore, because our tracking is quite good, we realized that it would be best for us to be shooting from further back in the smaller secondary launch zone. This avoids all the chaos going on between all of the bots in the larger primary launch zone, and would be easy for our drivers, since they wouldn't have to navigate through many moving robots. It also takes about 3 seconds for our spindexer to get fully loaded with the balls, and this would mean that if we were in the primary launch zone shooting, it would cause us to likely get hit by other bots, since we don't move while loading the balls.

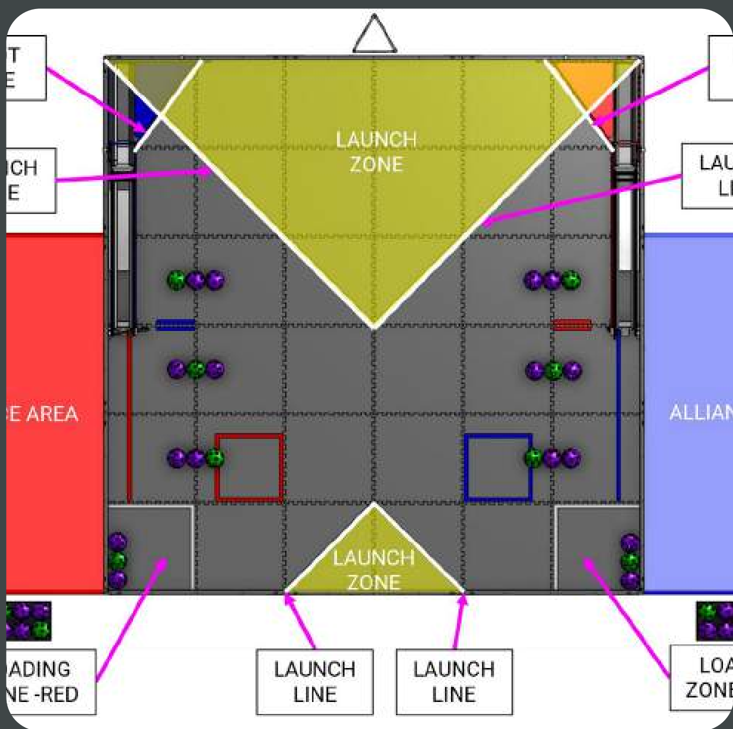




Why we chose this approach ?

This approach made our robot more resilient to unexpected disruptions. If a pathway was blocked, a defender was assigned to us, or an alliance partner needed us to switch roles mid-match, we could quickly adapt without sacrificing scoring potential. Ultimately, this gave our alliance a strategic advantage by keeping pressure on opponents consistently rather than peaking early and fading as the match progressed. We value criticality and reliability above all else and chose a path that reflected this.

We chose this approach because flexibility was the most reliable way to contribute value to our alliance in every possible match scenario. Different alliances and match conditions demand different roles, so designing our strategy around adaptability allowed us to complement our alliance partners rather than compete with them for the same space or resources.



Controls

Importance:

This year, our team added a component to the robot that we had never used before, the Limelight 3A camera. With this we were able to scan the april tags on the goalposts as well as the obelisk. Using the tag on the goalpost, we were able to adjust the angle of our shooter, so that it would always be locked onto the target. By scanning the obelisk we were able to communicate with our robot the pattern to shoot in for autonomous. We even developed our own color detection function with a color sensor to be able to shoot the pattern correctly.

Overview:

Our team uses Andriod Studio with a synced version of the newest FTC SDK to program. This ensures compatibility with competition standards and provides access to official libraries and tools. We also code with Java rather than Block coding because we have expierenced programs that chose Java.

Method:

We use modular programming, encoder-based movement, and telemetry. Modular programming divides our code up into different sections in different classes to test seperately making it easier to debug, encoders provide precise feedback for movement and positioning, while telemetry gives real-time data to drivers and programmers, helping us quickly diagnose issues and fine-tune performance.

Vision

This year, our team added a component to the robot that we had never used before, the Limelight 3A camera. With this we were able to scan the april tags on the goalposts as well as the obelisk. Using the tag on the goalpost, we were able to adjust the angle of our shooter, so that it would always be locked onto the target. By scanning the obelisk we were able to communicate with our robot the pattern to shoot in for autonomous. We even developed our own color detection function with a color sensor to be able to shoot the pattern correctly.

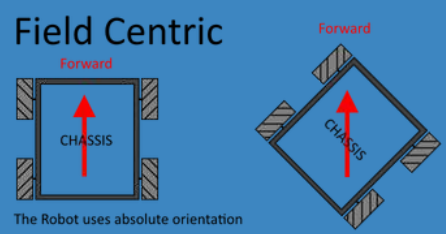
Color

We developed our own color detection program by observing the change in red, green, and blue values of our color sensor when facing a looking at a ball. This way we were able to ensure that our robot always knew the color of the ball it was intaking so that it would be able to shoot the balls in the correct pattern to score bonus points.

Movement

We use a robot-centric movement for Teleop, which allows for driver joystick inputs to be interpreted relative to the field rather than the robot. This means pushing the joystick forward always moves the robot forward on the field, regardless of its rotation.

The benefits of this were that our drivers had improved accuracy when driving because it reduced driver confusion and alignment errors when navigating. It also gave us a competitve advantage over other teams because the movements were precise and easy to understand.



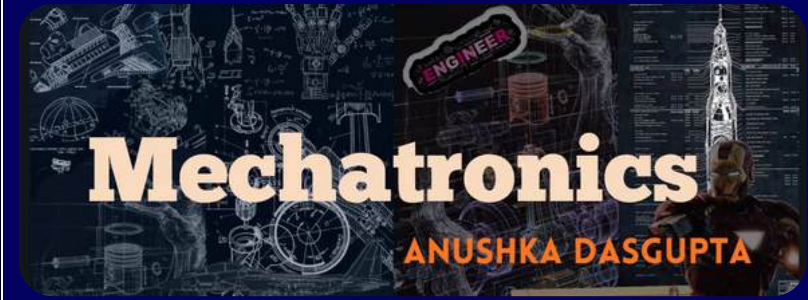
For our autonomous, we planned to use roadrunner, but when one of our odometry wheels stopped working, we decided to map out the movement manually.

Skill Development

Team Alphas developed valuable skills by learning from real-world engineering environments beyond FTC.

- At Nala Robotics, we saw how automation and smart design improve efficiency.
- Visiting Keerthi Industries taught us the importance of precision, teamwork, and quality control.
- At KIMS Hospital, we understood how reliability and data-driven systems directly impact people's lives.
- Teaching at The Shri Ram Universal School helped us build communication and leadership skills while sharing our passion for STEM.
- Learning from AMD and Collins Aerospace by RTX showed us how advanced technology, safety, and performance guide real engineering decisions.
- At our outreach program in My Home Avatar we learnt how important and fulfilling it is to inspire younger kids and help them experience the wow factor of robotics.
- Speaking to officials from Tech Mahindra helped us understand more about mechatronics and its uses at industrial level.
- Our presentation to officials from Warner Bros really helped us in improving our presentation skills and was very valuable to us in terms of their insights and suggestions to our team.
- Together, these experiences helped us grow as more thoughtful and capable engineers.

Learning



From our team's perspective, outreach has always been more than just helping others: it's about motivating and inspiring teams to believe in their potential. Throughout the season, we actively worked with two FTC teams, Araxys (29224) and Avengers Army (29225), sharing our journey, challenges, and learnings in FTC.

Instead of only teaching technical skills, we focused on encouragement and confidence. By openly discussing our design decisions, coding struggles, and competition experiences, we showed them that improvement comes through iteration and persistence. This helped both teams feel supported and motivated to push through difficulties rather than give up.

Seeing our progress inspired Araxys and Avengers Army to refine their robots, improve teamwork, and stay engaged with FTC. These interactions strengthened the sense of community within FTC and clearly reflected FIRST's values of Motivate, Inspire, Gracious Professionalism, and Cooperation.

ALPHAS

ENGINEERING THE FUTURE