



 **FIRST.** Workshop

Program Book

2024

Hosted by **technibots**
8565



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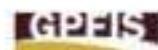


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Schedule

8:00 AM	Check in and Social Media Contest	
8:30 AM	Welcome and Guest Speeches	TI Auditorium (ECSS 2.102)
8:30-8:40	Welcome + Announce Social Media Contest # 1 winners	Fang Wang
8:40-9:00	Future Factory: Robotics in high tech manufacturing	Suz Ramsbottom, Vice President at Texas Instruments
9:00-9:20	Robotics Program at Collin College	Dr. Yiping Wang, Engineering Professor, Collin College
9:20-9:25	Cake Cutting and Networking; Drawing #1	
9:25-9:40	FLYSET Workshop History Trivia	Technibots Alumni
9:45 AM	FIRST Tech Challenge Track	TI Auditorium (ECSS 2.102)
9:45-10:05	Custom Pathing Analysis: Is it worth it?	18763 Texpland
10:05-10:25	FTC Summer Competition	19458 Equilibrium EXE
10:25-10:45	Sparkfun Odometry Sensor	7172 Technical Difficulties
10:45-10:50	Break (Drawing #2)	
10:50-11:10	Untangling cable management for everyone	21455 RoSophia
11:10-11:30	Consistency and Reliability in Competition	19066 AiCitizens
11:30-11:50	Reliable Approaches to Robot Design	17962 Ro2D2
11:50-11:55	Drawing #3	
9:45 AM	FIRST Lego League Challenge Track	ECSS 2.415
9:45-10:00	A Brief Perspective of Innovation Project	64793 PARDOBOOTS
10:00-10:15	Exoskeleton	84899 Legendary
10:15-10:30	Development of ARTFelt Project	50653 EV-Trekkers
10:30-10:45	Starring: Daises' Acoustic Board	60710 Starring: Daises
10:45-10:50	Break (Drawing #4)	
10:50-11:05	Vibe: Breaking the Sound Barrier to Enjoy Music	61084 Golden Phoenix
11:05-11:20	FLC Innovation: MangoBot --- An Art Companion Robot	52402 Pythoneers
11:20-11:35	Bagelbots's Innovation Project	60389 BagelBots
11:35-11:55	Submerged season SME and innovation project coach brainstorming session	
11:55-12:00	Drawing #5	
Lunch Break - Robot / AI Demos and Marketplace (12:00 - 1:00 PM)		
1:00 PM	Guest Speech and Planery Session	TI Auditorium (ECSS 2.102)
1:00-1:25	Going IN TO DEPTH about FIRST's Core Values	Lon Cherryholmes, PDC at FIRST in Texas
1:25-1:50	Swyft Robotics New Product Line for FTC + FRC	Matthew Thomas, CEO of Swyft Robotics
1:50-1:55	Swyft Robotics Product Drawings	
2:00 PM	OpenCV Lab (FLYSET FIRST Robotics Mentoring Forum)	ECSS 2.410
2:00-3:15	Hands on learning on OpenCV	FTC Technibots 8565
2:00 PM	Blue Track	TI Auditorium (ECSS 2.102)
2:00-2:15	Improving Your Software Structure	FTC 19458 Equilibrium EXE
2:15-2:30	Outreach in Rural and Urban Communities	FTC 20325 Maximum Resistance
2:30-2:45	Hyperion 9614's Centerstage Robot Outtake Evolution	FTC 9614 Hyperion
2:45-2:50	Break (Drawing #6)	
2:50-3:05	Using Cuttlefish to Enhance Your Software	FTC 14496 Robotopi
3:05-3:20	Beyond the Bots: Building a Winning FTC Team Off the Field	FRC 1296 Full Metal Jackets
3:20-3:35	What Makes a Good FTC Pit	FTC Microchips and Queso
3:35-3:50	AI Code Generation Agent	FTC 8565 Technibots
3:50-3:55	Drawing #7	
2:00 PM	White Track	ECSS 2.412
2:00-2:15	FTC Lawyer AI Based on Large Language Model	FTC 8565 Technibots
2:15-2:30	Rerating a Champion Bot: Intro to Robot Optimization	FTC 16236 Juice
2:30-2:45	Competitive Edge: Prototyping	FRC Students
2:45-2:50	Break (Drawing #8)	
2:50-3:05	KISS Design Process	FTC 14525 Terrabots
3:05-3:20	Driving Enhancements Using Software in FTC	FTC 23344 Technical Turbulence
3:20-3:35	Making Complicated Designs Work	FTC 12933 Robokings
3:35-3:50	How to Portfolio the Iron Reign Welch	FTC 6832 Iron Reign
3:50-3:55	Drawing #9	
2:00 PM	Gold Track	ECSS 2.415
2:00-2:15	Sensor Fusion using Kalman Filters	FTC 18227 Area 52
2:15-2:30	Optimizing Robot Design	FTC 21229 Quality Control
2:30-2:45	Summer Studies - SimplySwerve, Spines and Hoverpong	FTC 6832 Iron Reign
2:45-3:00	Networking for Beginners	FTC 14361 Robotobos Green
3:00-3:05	Break (Drawing #10)	
3:05-3:20	The Rookie Drop-off Crisis	FTC 12928 Lightsaders
3:20-3:35	Make Your Presentation & Portfolio Inspiring	FTC 8365 Gearmasters
3:35-3:50	The Shopping Cart Swerve	FTC 18270 Roboplayers
3:50-4:05	Robot Optimization	FTC 21354 EPIC Expedition
4:05-4:10	Drawing #11	

Morning Guest Speeches



Keynote Speaker



Suz Ramsbottom

Vice President, External Manufacturing and Product Distribution at Texas Instruments

Topic:

**Future Factory
Robotics in High Tech Manufacturing**

Guest Speaker



Dr. Yiping Wang

Engineering Professor, Collin College

Topic:

Robotics Program at Collin College



Afternoon Guest Speeches

Guest Speaker



Lon Cherryholmes

Program Delivery Coordinator at *FIRST* in Texas

Topic:

Going IN TO DEPTH about *FIRST's* Core Values



Guest Speaker



Matthew Thomas

CEO, Swyft Robotics

Topic:

Swyft Robotics New Product Line for FTC/FRC



Fun Activities

Celebration Cake



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Lunch Break Demos by FTC 6832, 7172, 18227, 23213, 23344



The FIRST logo, featuring a stylized 'F' made of red and blue geometric shapes.

FIRST Workshop

**FIRST Tech
Challenge
Track**



Morning FTC Track



Texpand 18763

Cape Town, South Africa

Custom Pathing Analysis: Is it worth it?

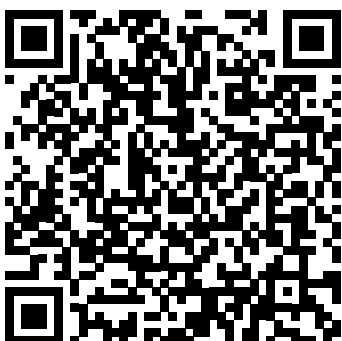


Texpand discusses why developing custom pathing is worth your time over just using a library. They cover the pros and cons of both custom pathing and pathing libraries. This will include why even though coding your own pathing will take longer initially, it will save you a lot of time in tuning and debugging later. They also talk about why they feel it's better as a rookie team to start without pathing at all and use something like PID to point and build up to pathing so you have a better fundamental understanding of odometry and drivetrain control, which is very necessary when working with any type of pathing whether custom or library.

Equilibrium.exe 19458

Potomac, Maryland

FTC Summer Competition



Equilibrium.exe's annual summer program is a crucial step in preparing students for the FTC season. Over nine weeks, 31 students participate in a mock FTC game, where they design build a robot to complete specific tasks. The program sharpens technical skills and also fosters teamwork, problem-solving, and strategic thinking. Participants learn to address challenges, adapt to constraints, and develop creative solutions. This approach helps students get accustomed to the competitive environment while allowing them to explore FTC in a lower-stakes setting.

Morning FTC Track



Technical Difficulties 7172

Plano, Texas

Sparkfun Odometry Sensor



Team 7172 Technical Difficulties discusses their use of the Sparkfun Odometry Sensor and highlights its advantages over traditional methods in improving localization for autonomous periods. This sensor provides accurate tracking while using minimal space and can be easily integrated with the FTC SDK. It also demonstrated consistent performance during practice and matchplay. This is because

RoSophia 21455

Galati, Romania

Untangling Cable
Management for Everyone



The presentation contains all sorts of tips and tricks for general wiring practices for FTC. A wide range of connectors with their pros and cons is presented, along with good practices for wiring and how people should take care of their exposed cables. Then RoSophia discusses on thinking how to keep your wiring tidy and modular using examples from their bot. By this showcasing how you should 'layer' your cables to be accesable and protected. Lastly they emphasize the importance on leaving ways for cable management during CAD processes.

Morning FTC Track



AI Citizens 19066

Focsani, Romania

Consistency and Reliability in Competition



AI Citizens gives an in-depth explanation on why consistency and reliability are two very important factors in FTC robots. They explain what makes hardware reliable and why more complex bots will always be harder to make reliable. 19066 also presents some software including fail-safes, fallback modes, use of sensors and automations going over why driver practice is important in determining failure points and increasing consistency. They discuss the importance of muscle memory and how it influences the robot design. Overall, it's impossible to 100% predict what happens; all we can do is prepare for the worst and know how to fix anything that

Ro2D2 17962

Ploiesti, Romania

Reliable Approaches to Robot Design



In their presentation, Ro2D2 talks about some of the most important aspects during the 3D design process of robot iteration. To begin with, they start the presentation with the significance of a custom drivetrain, how it can be designed, and what advantages and disadvantages they discovered along the manufacturing and building process. For instance, how to use the available space on the drivetrain efficiently, without leaving empty spots.



***FIRST* Lego League Challenge Track**



Morning FLL Track



PARDOBOOTS 64793

Sao Paulo, Brazil

A Brief Perspective of Innovation Project



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The first presentation in the FLL Challenge Track is team 64793 PARDOBOOTS hailing all the way from Sao Paulo, Brazil! In the masterpiece season, they won 1st place in Robot Design at regionals, were the national runner-ups, and was a finalist for the Champions Award at worlds, where they also won 3rd place in the Coach's award. Enjoy their presentation on a brief perspective of their innovation project! They walk through all the steps of designing their solution, from brainstorming to connecting with professionals to prototyping.

Legendary 64699

Hangzhou, China

Exoskeleton



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Team 64699 Legendary is based in Hangzhou, China. Their dream of going to the world championship united them this season. They for the common goal of exploring their limitless and imagination. They'll be presenting on "Exoskeleton". Exoskeleton is their innovation project that teaches all populations how to dance. Through complex mathematics and ingenious designs, Team Legendary spreads the power of dance with their highly enjoyable innovation project.

Morning FLL Track



**EV-TR3KK3RS
50653**

Dallas, Texas

Development of the ARTFelt Project



This presentation explores how 50653 created ARTFelt, a groundbreaking project designed to make art accessible to individuals with disabilities. ARTFelt was born from a desire to bridge the gap between art and inclusivity. The project involved extensive research, innovative brainstorming, and collaboration with experts. Through iterations in software and hardware development, the team transformed 2D artworks into 3D tactile experiences, complemented by custom AI-generated audio descriptions. Engaging with the community was also key to refining ARTFelt. The project's success is reflected in multiple awards, including 1st place at the American

Starring: Daisies 60710

Dallas, Texas

Starring: Daisies' Acoustic Board



Team 60710 Starring: Daisies is a six member, all girls FLL challenge team from the Hockaday School. They won 3rd place in qualifiers as well as 1st place core values at regionals. They present their innovation project acoustic board, inspired by those in orchestra halls. After discovering the common issue that acoustic boards are ineffective, 60710 set out to create a working solution to this problem. They designed a moving set of boards made to turn with the music.

Morning FLL Track



Golden Phoenix 61064

Arizona, US

Development of the ARTFelt Project



Golden Phoenix Team #61064 is rookie FLL team formed during the Master Piece season. In their inaugural year, they advanced to the Arizona State Championship and earning 2nd place as State Champions. They were also honored with the prestigious Engineering Excellence Award at the World Festival. In addition to their competition achievements, they actively promoted the FIRST program at the Arizona School for the Deaf and Blind and at the Barnes & Noble store in Chandler, AZ. They'll be presenting today about Vibe, their innovation project that goes hand in hand with their community efforts- removing the barrier to enjoying art for the deaf and blind.

Pythoneers 52402

Irving, Texas

FLC Innovation: MangoBot ---
An Art Companion Robot



Team 52402 Pythoneers won first place in the Texas State competition for FLL-C, as well as the Breakthrough Award at the World's Championship in the Masterpiece season. In this presentation, they present our Innovation Project, MangoBot. MangoBot is a humanoid robot that detects the user's emotion, plays the right music, and dances. MangoBot revolutionizes the world of by helping kids calm down or raise their mood. They discuss the season's journey of coming up with the idea of this humanoid, their design process, and the various outreach events they participated in.

Morning FLL Track



BagelBots 60389

Dallas, Texas

Bagelbots's Innovation Project



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BagelBots, team 60389 are a group of passionate 6th–8th graders united by their love for robotics and innovation. The MasterPiece season was their first ever in the FLL world! It was an incredible journey of teamwork and growth, earning them awards all the way up to the State level! Enjoy their presentation about their innovation project. Their project aims to teach music in an accessible manner. With their innovative technology, kids around the world can learn music easily as long as they have access to electronics.

Submerged season SME and innovation project coach brainstorming session



Join coaches and mentors with decades of FIRST experience to discuss strategies for brainstorming in the FIRST DIVE Season. This presentation will help rookie and veteran FLL teams alike as they embark on a deep dive into technological innovation!



The logo for FIRST Workshop, consisting of two interlocking geometric shapes, one red and one blue, with a white circle in the center.

FIRST Workshop

Blue Track



Blue Track



Equilibrium.EXE 19458

Potomac, Maryland

Improving Your Software Structure



In 19458 Equilibrium’s presentation, they will cover:

- How to organize code generally
- How to make auto selection easy at the field for drive team”

Maximum Resistance 20325

Aledo, Texas

Outreach in Rural and Urban Communities



20325’s mission is to equip your teams with the essential skills to connect meaningfully. Drawing on their experiences, including captivating stories from their podcast and impactful partnership with Parker County 4-H, they’ll guide you through each step to ensure your outreach resonates. Discover the art of effective communication as they delve into how to engage with diverse audiences while staying true to the core values of FIRST. From mastering the art of the interview to uncovering the hidden gems

Blue Track



Hyperion 9614

Fremont, California

Hyperion 9614's Centerstage Robot Outtake Evolution



This presentation covers the process involved in designing and building Hyperion 9614's outtake subsystem from their 2023-2024 robot. This includes the ideologies for design resulting from brainstorming after kickoff, demonstrations of the CAD prototypes and simulations involved in the designing process, the first built iteration that competed up to the regional championship, and motivations for choosing to extend the horizontal extension even further and add an extra degree of compliance. The final design's features will be covered as well. Features that were covered in less detail during the Behind the Bot will be focused on more.

Roboctopi 14496

Escondido, California

Using Cuttlefish to Enhance Your Software



Cuttlefish is a software framework designed to make both the robot programming process, and the resulting code simpler, faster and better. It contains a variety of features that are useful including dead wheel odometry, waypoint based navigation, and a queue based task scheduling system. Cuttlefish is designed to be modular and expandable allowing it to work in conjunction with custom team written code. In addition, Cuttlefish also contains an alternative device system that allows users to access devices directly by port, which makes changes to robot hardware faster.

Blue Track



FRC Full Metal Jackets 1296

Rockwall, Texas

Beyond the Bots: Building a Winning FRC Team Off the Field



FRC Team 1296 Full Metal Jackets share valuable tips from their experienced team on running an effective robotics team. From meeting management to fundraising ideas, they walk you through all the necessary steps to keep a FIRST Team running. Specific details include team structure, meeting details, fundraising outlets, team spirit, and more.

Microchips and Queso 23350

San Antonio, Texas
What Makes a Good FTC Pit



A team's pit is more than just a workspace; it's a reflection of their team identity, team spirit, the robot. This presentation explores the art and science of creating an effective FTC pit and finding the balance between aesthetics and functionality. Learn how to design a space that not only impresses judges and other teams but also enhances team efficiency and productivity. Essential elements such as pit layout, decoration, organization, and the role of pits in competition success are covered. Teams will have the tools to transform their pit into a space that makes their team stand out.

Blue Track



TechnicBots 8565

Plano, Texas

AI Code Generation Agent for
FTC opmodes



The AI Code Generation Agent project aims to automate the process of initializing FTC robot configurations, saving time and addressing the issue to errors during robot setup. The project combines XML parsing, AI-powered code generation via Groq, and a simple user-friendly interface built with Python's tkinter library to produce a base for future improvement. The agent's accuracy is increased using prompt engineering and implements syntax highlight for easy readability. While the current implementation shows promise in saving time and reducing errors, future improvements could include enhanced UI, integration with other tools, and upgrading to a more advanced language model.



FIRST Workshop

White Track



White Track



TechnicBots 8565

Plano, Texas

FTC Lawyer AI Based on Large Language Model



Understanding the competition manual is one of the most important tasks for any FTC team. Most teams designate a “lawyer” to comb through these mountains of text, but human lawyers have significant limitations that often restrict their performance. FTC Lawyer leverages recent advancements in generative AI, such as retrieval-augmented generation (RAG), to create a conversational agent with knowledge bases from the competition manual and Q&A forum. Initial testing demonstrates FTC Lawyer’s immense capability to assist both veteran and rookie teams, empowering them to unique, rule-aware robot designs and a better understanding of FTC.

Juice 16236

Folsom, California

Iterating a Champion Bot: Intro to Robot Optimization



The biggest takeaway from Juice’s hardware thought process is that simplicity is key. From designing to building, they balance functionality with ease. For example, in their first iteration of the robot, they had a complex gear shifter that swapped the gear ratio of our lift motors to allow us to climb during the endgame. By discovering the cause of their problems, they simplified the robot, enabling agility and functionality. While many teams put heavy emphasis on prototyping, they find that engaging in mastersketching through tools like crayola CAD help create visual models without wasting time and resources on making physical prototypes.

White Track



FRC Students

Dallas, Texas

Competitive Edge:
Prototyping



Prototypes can make or break your FTC or FRC Robot. In this presentation, FRC students share their experience with prototyping from initial designs to final competition robots. They discuss topics like the KISS Design, how to strengthen your prototypes while keeping them simple, and more. Prototyping greatly reduces both time and cost of the design process, as demonstrated by real-world examples from this presentation.

Terrabats 14525

San Jose, California

KISS Design Process



One revolutionary design idea of the FIRST Tech Challenge (FTC) is “Keep It Super Simple” (KISS). This talk explores how teams can improve their robot design and performance by utilizing the power of simplicity. Teams may reduce complexity, increase dependability, and expedite troubleshooting by keeping things simple, which will result in a more seamless and fruitful competition experience. For teams just starting out, this means avoiding getting caught down in elaborate, risky ideas. Less downtime and consistent performance are the results of simple, dependable solutions. Veteran teams also find the KISS design useful for their designs.

White Track



Technical Turbulence 23344

Plano, Texas

Driving Enhancements Using
Software in FTC



In FTC Robotics, winning competitions isn't solely determined by the robot's capabilities. Since the majority of points are earned during the driver-controlled (TELEOP) phase of the game, the skill of the driver plays a crucial role in a team's success. Therefore, any methods that can improve driving abilities or reduce driver errors are essential. This presentation will outline some ways that programmers can enhance TELEOP scores by simplifying the driving experience. Although there are numerous ways to enhance TELEOP, Technical Turbulence will demonstrate the specific driver improvements they have implemented (and how you can apply them).

Robokings 12993

Sunshine Coast, Australia

Making Complicated Designs
Work



Robokings discuss the important things that you need to do on your robot to make a complicated design actually operational. Main points include: the importance of optimising weight and tips to do so, wiring over long distances, ways to optimise battery draw in a match, finding and eliminating as many failure points as possible. They will also talk a little about the code and control optimisations we have had to implement that help a complicated design run smoothly. They will also discuss the pros and cons of complicated designs, whether it's worth it depending on each team's season goal.

White Track



Iron Reign 6832

Dallas, Texas

How to Portfolio the Iron
Reign Weigh

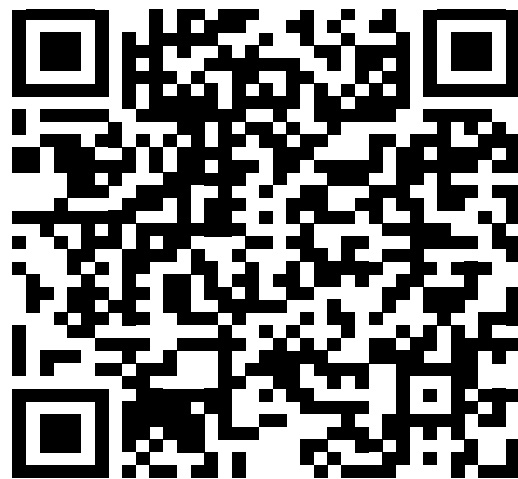


Do we know what's happening with blank sections of the new competition manual? Nope. Not a bit. But the smart money is ... not huge changes? Iron Reign shares their approach to Portfolio.



FIRST Workshop

Gold Track



Gold Track



Area 52 18227

Plano, Texas

Sensor Fusion using Kalman Filters



Odometry is a great way to consistently localize your robot, especially in the autonomous period. However, odometry can be subject to heavy amount of drift when moving across long distances. That's where Area 52 uses the sensor fusion algorithm, the Kalman Filter, by combining localization data including Visionportal and AprilTags. By using concepts from statistics and probability we can develop a dynamic algorithm is able to weight location data from sources over another. From this sensor fusion algorithm, we can use the odometry wheel's high reliability along with the high accuracy of the AprilTags to create a robust localization system, which can be used for path following libraries including RoadRunner.

Quality Control 21229

Bellevue, Washington

Optimizing Robot Design



Team 21229 Quality Control, the 2024 FTC World Championships Franklin Division Innovate Award Winner, will present some examples and tips on optimizing robot design. They will walk through how they improved their robot design during the Centerstage season and the unique designs on their robot. Some design improvements include designing an efficient and fast intake/ transfer ramp with higher error margin and less pixel jams, making the drone launcher more reliable, and adding failsafe mechanisms to the outtake. Some lessons learned and general advice on improving robot design will be shared as well.

Gold Track



Iron Reign 6832

Dallas, Texas

Summer Studies - SimplySwerve, Spines and Hoverpong

Every summer at Iron Reign 6832 is filled with experiments. They will share our progress on a from-scratch mono swerve drive, a tendon operated spine or arm joint system, and a personal hover platform



Robolobos Green 14361

Cedar Park, Texas

Networking for Beginners



- Effective networking can significantly impact a team's resources and opportunities in competitions.
- Pre-existing relationships ease the process of reaching out to companies
- Maintaining connections through consistent updates and interactions -
- Have clear objectives to convey purpose
- Companies value corporate social responsibility initiatives; aligning with such programs can strengthen outreach efforts.
- Engaging with local businesses and universities can provide unique mentorship opportunities and resources tailored to your team's needs.

Gold Track



Lightsaders 12928

Austin, Texas

The Rookie Drop-off Crisis



In the Texas region, around 50 new teams are created every year. However, around a third of those teams quit after only one year, and close to half are gone after two years. Luckily, any team can help by doing a couple of things. A veteran team can present themselves as a source of open information to Rookie teams, and be welcoming during matches. Veterans' patience also helps the FIRST community feel more calm, and less like a fight to the death tournament. Overall, the most important thing is to be a source of encouragement, and interact with them to help ease the transition.

Gearmasters 8365

Forest Hills, New York

Make Your Presentation & Portfolio Inspiring



For teams with the content to win the Inspire Award, this is the next step to distinguish themselves at fast-paced competitions. This presentation will focus on: (1. Judging Room & Pit Judging) and (2. Portfolio). We will cover:

- > Branding: the main way to stand out.
- > Presenting as a team: the importance of involving everyone.
- > Preparation for the Judging Room: memorization tips, what are the key focuses, how to practice your script, and more!
- > Award-oriented focuses: understanding what the judges are looking for.
- > Streamlined Portfolio: making your portfolio clear and concise.

Gold Track



EPIC Expedition 21354

Plano, Texas

Robot Optimization



From a team that made it to regionals in their rookie season through a double qual to a team that got the most prestigious, non-inspire award at every level up till worlds, EPIC has seen a lot of growth in their team. They will show their iterations for the CenterStage robot. Their iterations were a crucial part of advancing via Think, as the judges were able to see they utilized the engineering design process in order to make the most efficient robot they could.

Roboplayers 18270

Irving, Texas

The Shopping Cart Serve



In the FTC, numerous drivetrain options are available each with their respective advantages and drawbacks. 18270's presentation highlights yet another type of drivetrain known as the swerve drive, which comes in three variations: coaxial, differential, and the shopping cart swerve. The drivetrain we aim to exhibit and demonstrate is the shopping cart swerve. It resembles a differential swerve in using 4 motors, but the wheel's axis of rotation is offset from the pod's center, resulting in instantaneous pivoting and swift directional changes. While the shopping cart swerve has high traction and acceleration, its programming complexity and potential need for several design iterations before achieving optimal functionality present significant

Social Media Challenge #1

WINNERS:

- FTC 14496 Roboctopi
- FTC 26235 Robogenesis
- FTC 20325 Maximum Resistance

Use #flyset10 to enter



Prizes to
the top 3
most liked
posts



Social Media Challenge #2

**WINNERS:
ITKANSQUAREONE**

#technicbots10 to enter



**Prize to
most liked
post!**





Thank you for attending the 10th
Annual FLYSET Workshop