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SAT prep FLORIDA

ACT prep FLORIDA

LOS TOROS LOCO

20357

TEAM ROLES

DRIVER 1	DRIVER 2	DRIVE COACH	HUMAN PLAYER
CHRISTIAN	ZACH	GABRIELA	ETHAN

PROGRAMMING

LEAD PROGRAMMER
DAVIS

ASSISTANT PROGRAMMER
ZACH

SUPPORTING PROGRAMMER
AI (CURSOR)

MEDIA

SOCIAL MEDIA
AMELIA

SOCIAL MEDIA
CHRISTIAN

DOCUMENTATION
BRANDON

PORTFOLIO
GABRIELA

DESIGN

LEAD DESIGNER
GABRIELA

SUPPORTING DESIGNER
CHRISTIAN

NEW MEMBERS

TRAINEE
LEO

TRAINEE
NOLAN

TRAINEE
AUSTIN

TRAINEE
DURHAM

SUSTAINABILITY

After 5 years of being sponsored by Tocoi Creek High School, our team is now shifting to be community run.

- To ensure that team 20357 remains a competitive team in the future, we decided to prepare for our future by enlisting new members that will hopefully remain as we transition as an independent organization.
- This transition also marks an opportunity for our team to become more involved in our community by exploring sponsorship to support our team.

SEASON GOALS

Our goals this season were to have a more organized team, faster prototyping and iterations, more use of CAD and simulations, assigning roles and organized workflow prioritizing reliability and our largest goal competing at a state level (and now maybe at a national level)!

GAME STRATEGY

In this season for Decode, our team communicated and agreed to **maximize throughput** and speed in our robot.

- Early on we knew we had to compromise color sorting to achieve faster throughput as building a sorting mechanism would add time to our throughput.
- We believed that by having a fast enough throughput, achieving patterns would be unnecessary because we could score minimal points quickly, i.e. **quantity>quality.**

BUILD CONSTRAINTS

- In the beginning of the year **we were limited to only using Tetrix parts.** Our team recognized that by continuing to use worn out and irrelevant parts, our robot wouldn't succeed.
- This year marks the transition for our team using Tetrix parts to Gobilda parts however **the assortment of available Gobilda parts are limited** due to costs.
- Costs to shift from Tetrix to Gobilda influenced the result of our design heavily by making our designs more **intentional** and **conservative** with what parts it uses.
- We addressed budgeting issues for new parts by reaching out to our community and parents to help pitch in to afford more parts beyond which our shcool could sponsor.

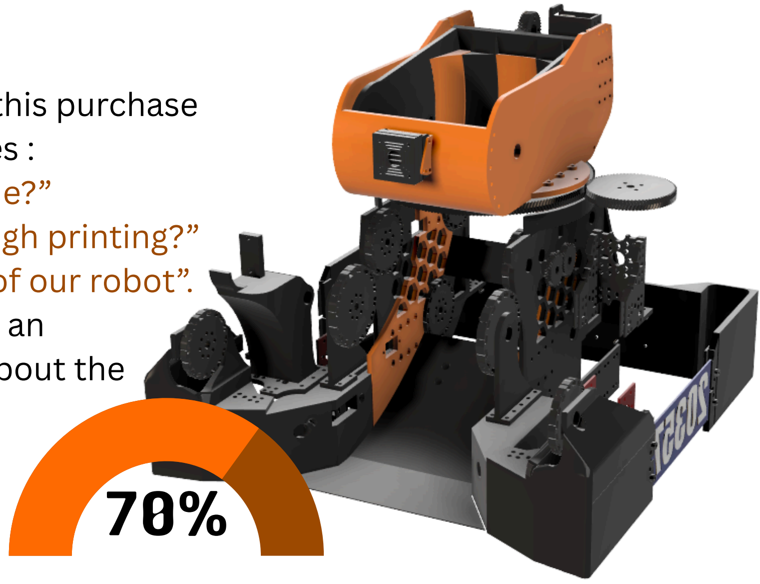
ROBOT COMPOSITION

With our financial restraints in mind, we approached this purchase of parts by having a frugal mindset. We'd ask ourselves :

- “Is there a less costly version of this product online?”
- “Can I make my own version of this product through printing?”
- “Is this product necessary for the basic function of our robot”.

By asking these questions we were able to stay within an affordable budget and enabled us to think critically about the design of our robot.

For this reason, a large amount of our robot is 3d printed, as shown in the shell of our robot (all standard components removed). Using 3d printed parts has its unintended benefits, such as being able to **iterate quickly, low costs, and low weight.**



~ 70% of our robot is 3D printed.
Fun fact: in order to reprint all the parts for our robot it would take at least **800 grams** of filament and roughly **30 hours**

DESIGN STRATEGY

In order to align with our game strategy, we first established a clear design strategy to understand what kind if robot we wanted and how we would achieve such design. Our process follows these principle steps:

DEFINETHE PROBLEM → **RESEARCH SOLUTIONS** → **DESIGN ON CAD** → **PROTOTYPE** → **EVALUATE** → **REDESIGN**

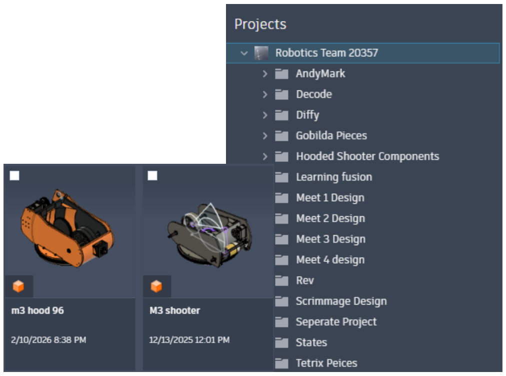
ESTABLISHING A VISION

When designing we first looked to other sucessful mechanisms as inspirations to get an ideas for what worked, and didnt work, for other teams.

- Resources such as the **FTC discord** was useful as a tool to find design inspirations and speak to teams directly on design outcomes
- Other robotics competition such as **VEX and FRC** provided inspiration on mechanism based on games from previous seasons which dealt with a similar design constraint
- Simple **trial and error** also determined design choices on our robot, for example in our intake we ran several tests to determine what compression allowed the ball to be picked up smoothly.

SETTING GOALS

When designing as a team, we chose to organize our robot in **separate 'modules'**, allowing us to focus on the design needs of a singlular mechanism at a time and providing ease when needing to edit a certain mechanism.



Projects
Robotics Team 20357
AndyMark
Decode
Diffy
Gobilda Pieces
Hooded Shooter Components
Learning fusion
Meet 1 Design
Meet 2 Design
Meet 3 Design
Meet 4 design
Rev
Scrimmage Design
Seperate Project
States
Tetrix Peices

m3 hood 96
2/10/2026 8:38 PM

M3 shooter
12/13/2025 12:01 PM

DRIVETRAIN

- Fit within sizing constrains
- Withstand offensive game play
- Display our team number

HOOD

- Ability to rotate 360 degrees
- Have adjustable angles
- Accommodate wire limitations
- A flywheel that can quickly be powered

TRANSFER

- Moves artifacts from intake to hood
- Store 3 artifacts

DEFINING SUCCESS

"IF IT AIN'T BROKE, DONT FIX IT"

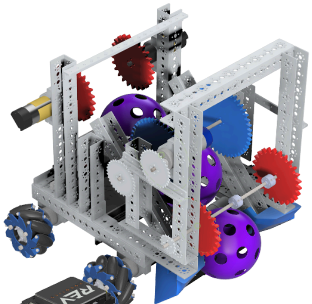
- Sometimes a **simple, yet elegant**, design beats an overly complex solution
- For example out turntable is simply being powered by a single motor that is attached by a channel to our drivetrain
- We evaluated the success of a design by determining if it effectively performed its function and if it maintained its usefulness throughout competitions.

PLANNING

- Once a vision was set, and we understood our goals, we would begin designing a solution in **Fusion 360.**
- Every design change is reflected in Fusion, organizing our projects into different folders based on competing designs

DESIGN HISTORY

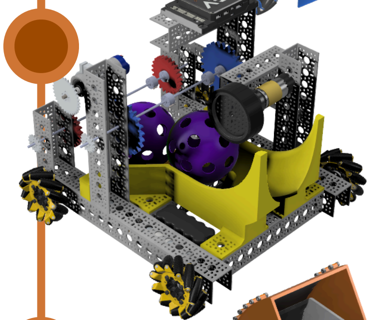
SEP 27TH



SCRIMMAGE

The scrimmage was by far our simpilest design, or robot consisted of only a intake, however this allowed us to test out or different intake designs like rubber band which ended up sticking

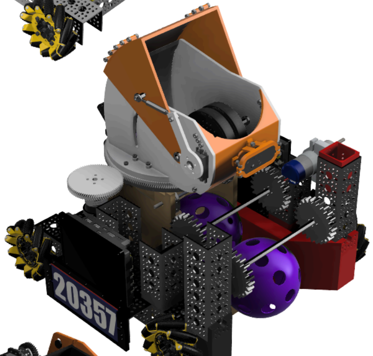
NOV 8TH



MEET #1

By our first meet launcher was fairly strong and reliable, however our gate mechanism was not. Due to using plastic servo horns as opposed to aluminum our gate was loose and allowed balls to get stuck or slip through.

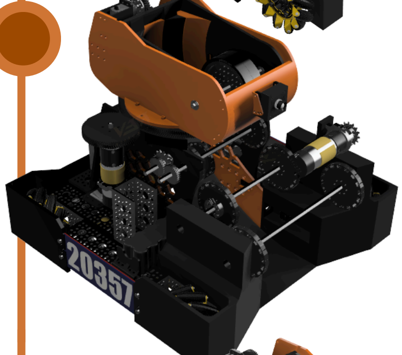
DEC 6TH



MEET #2

For our 2nd meet we pivoted our design from fixed shooter to a hooded turret. We also changed our gate design to iterate on the old design, however we still encountered issues with the servos being to slow when feeding the launcher and not reaching the fly wheel

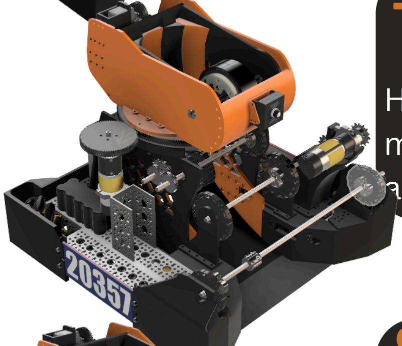
JAN 10TH



MEET #3

By our 3rd meet we had the design down. We swapped our gate rollers to motors to allow for more consistent shots, upgraded our camera, and upgraded our intake while also providing shielding for our wheels

JAN 30TH



TOURNAMENT

Heading into our tournament we made a few smaller mechanical changes such as upgrading intake motors adding fly weights and increasing the length of our intake

STATES

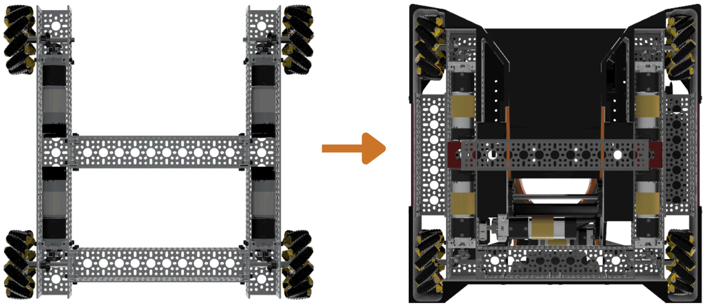
During our tournament competition we realized that we had to limit the velocity of our intake to compensate for rubber band expansion, so we swapped to gecko wheels with a mix of tubing intake. We also decided to purchase odometry to improve localization.

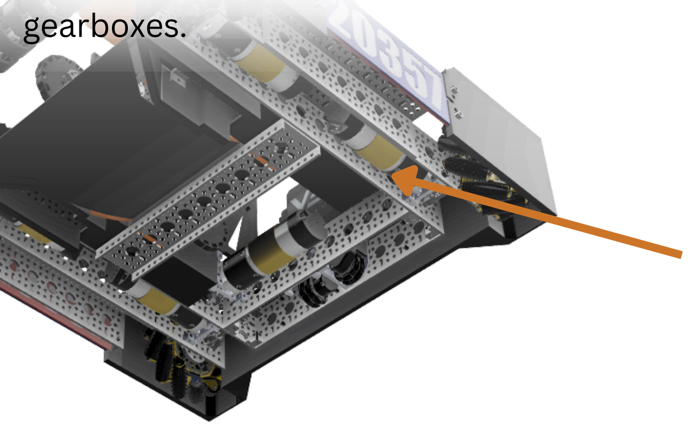
MAR 6TH

DESIGN COMPONENTS

DRIVETRAIN

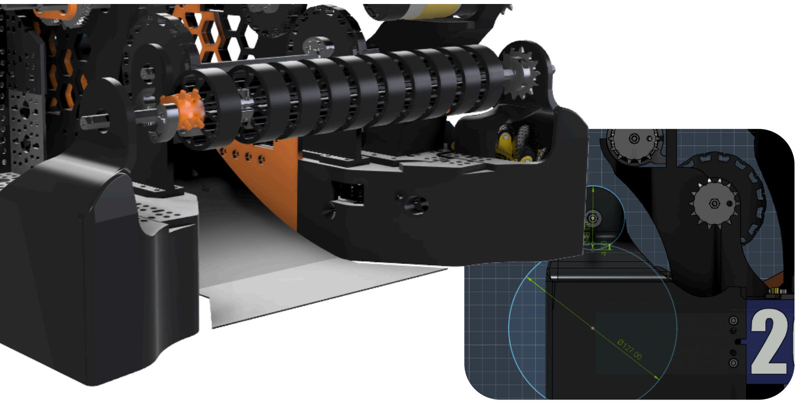
We wanted our robot to withstand the aggressive playing style of this season’s game. By adding **3D-printed barriers** along the perimeter of our robot, we can protect our drive train motors from collisions and prevent unexpected loads that could damage gearboxes.





- To have barriers around our robot, we would have to shorten our drivetrian to accomodate the space.
- **We modified the Gobilda Strafer Starter-kit by replacing the middle supporting beams with 9 hole thin and normal channels.**
- Switching to the a thin middle channel allowed us more space for mounting the ramp and wire management

INTAKE



Throughout the season we maintained rubber band intakes inspired by Vex teams. However we **evaluated** a few benefits and drawbacks to this kind of intake that eventually led us to recently change the mechanism.

PRO

- Because the sprockets that held the rubber bands were **3D printed** we could easily adjust the compression of the artifact, **cheaply**.

CON

- Due to expansion of rubber bands, we **couldn't run our front intake at max velocity** without the rubber bands going over the 18 in sizing constraint

REDESIGN

Our solution was to invest in **gecko wheels and rubber tubing**. Inspired by our alliance team at regional, having a dual gecko and tubing intake allowed us to immediately touch and control the artifacts on the field.

Our current design attempts to **maximize the area from which balls can be intake** by having the first stage intake take up the maximum amount of space possible in our robot, 416 mm

- We had to iterate several times with trial and error to find the correct compression
- Thanks to intentional designing, we separated our part that holds up the intake and part that acted as a funnel
- as a result, instead of reprinting the entire funnel and intake together, we could simply reprint the part we were modifying.

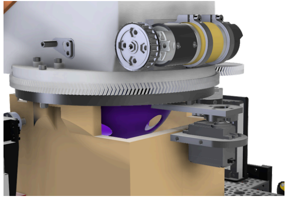
DESIGN COMPONENTS

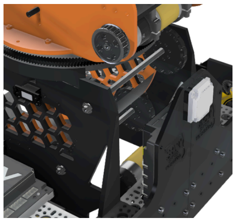
RAMP+TRANSFER ROLLERS

Our ramp fits up to 3 artifacts in its cavity and also utilizes rollers for the transfer of the ball upwards.

PROBLEM

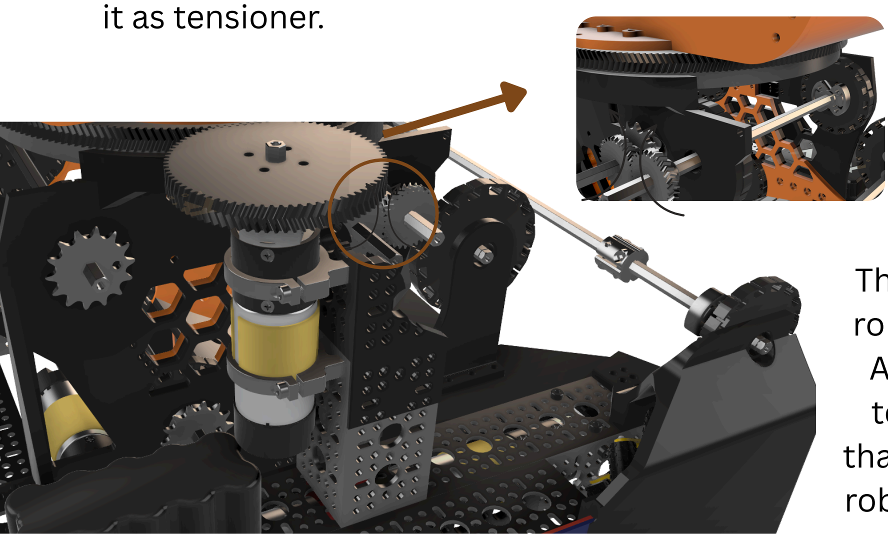
- Previously, on our meet 2 design, we faced a challenge with pushing the balls high enough to touch the flywheel.
- Our solution at the moment was to create a ‘knife’ component that could slice the balls upward. T
- his design limited our throughput by forcing us to shoot balls one at a time.





We again used chains and sprockets to power these rollers; there was some challenge in doing so.

- Firstly, there were issues in making sure that the chain wouldn't slip from its sprocket. The way that the sprockets are aligned requires that the chain be extremely tight.
- We overcame this problem by tightening a screw between our ramp and turret motor channel and using it as tensioner.



SOLUTION

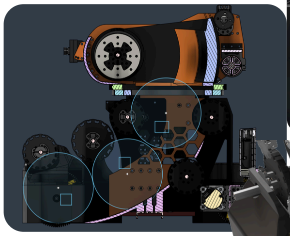
- We decided to reuse the same mechanism of rubber band rollers that worked on our intake to work for transfering the artifact
- Using rollers instead of a knife enabled speed adn accuracy when moving when controlling the ball

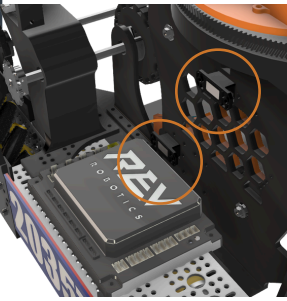
TRADEOFF

limited visibility with rubber bands in the way of seeing the artifact

COMPROMISE

created pockets in the ramp walls to see through the robot





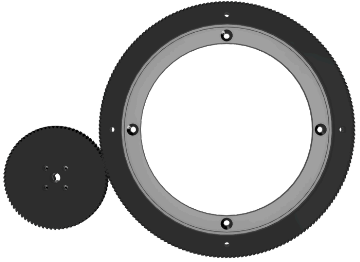
Integrated color sensors into the walls of our robot, one sensor is inside the funnel.

TURNTABLE

The turntable is a noteworthy component of our robot that makes us stand out from other teams. After the scrimmage, we recognized that many teams would have a static outtake component that would limit the freedom of locations in which robots could shoot. For this reason, we stuck with a turntable turret design that would allow for flexible scoring from its 360-degree rotation.

WHAT WE WANTED VS WHAT WE GOT

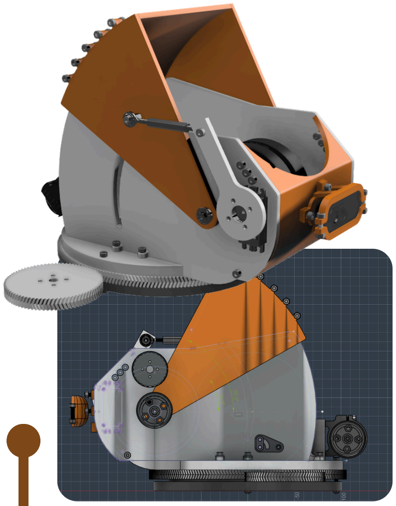
WHAT WE WANTED	WHAT WE GOT
63$ - Andymarks Turntable Assembly • Too expensive and would arrive late	18$ - 8 in lazy susan bearing ~1$ - 3D printed herringbone gears



Through a few extra steps, we were able to develop a turntable that uses 3d printed herringbone gears for reliable use while also remain cost effective.

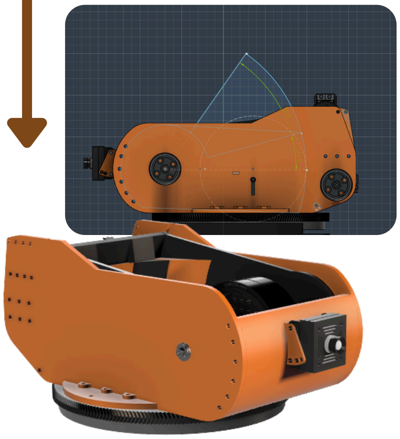
DESIGN COMPONENTS

ADJUSTABLE HOOD



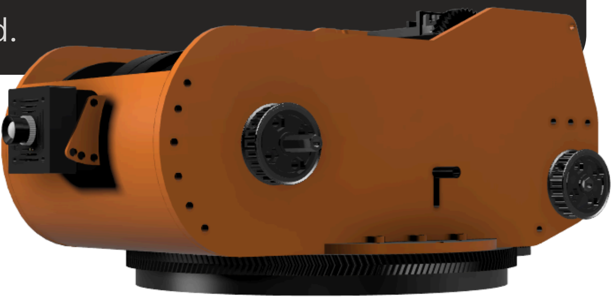
We first successfully used an adjustable hood design in Meet 2, but some problems emerged with our first attempt at the approach.

- When designing the hood, we placed the minimum angle too high, causing restriction on where we could shoot during matches.
- Moreover, we did not consider wire management. In this design, wires were sometimes too short and exposed, making our robot fragile.
- For our flywheel, it took too long between balls fired to reach the target velocity again
- Lastly, our camera was not dependable enough to track April tags, therefore defeating the point of a turret.



In our current design of the hood, we strived to address these issues.

- The hood was redesigned so that the **minimum angle was lower**,15 degrees- 50 degrees, instead of 30 degrees - 65 degrees.
- **Wire management was regarded** during the reconstruction of the hood by creating purposeful holes for zip ties and wires to go through. Additionally, we used **retractable strings** and cable covers to ensure that wires were kept close to the robot and protected.
- In order to maintain velocity, we considered the laws of inertia (more mass = harder to change motion), hence increasing the mass of our flywheels by **adding flywheel plates.**
- This issue with our camera was fixed by buying a **new camera** with higher fps, guaranteeing that the frames between sudden movement are being tracked.



WE ALSO IMPROVED THE TURRET BY:

- switching hood adjustments from a lift mechanism placed outside of the walls of the hood to a gear system placed between the walls so we can have precise control of the hood angle and protect the crucial components.
- switched from a fixed camera angle to an adjustable camera angle for testing purposes.
- added googly eyes to the side of our hood, creating personality

SOFTWARE STRUCTURE

We structured all of our code using GitHub because it enhances collaboration, iterative design, and version control. We separated each of our subsystems into its own Java classes for ease of use and readability.

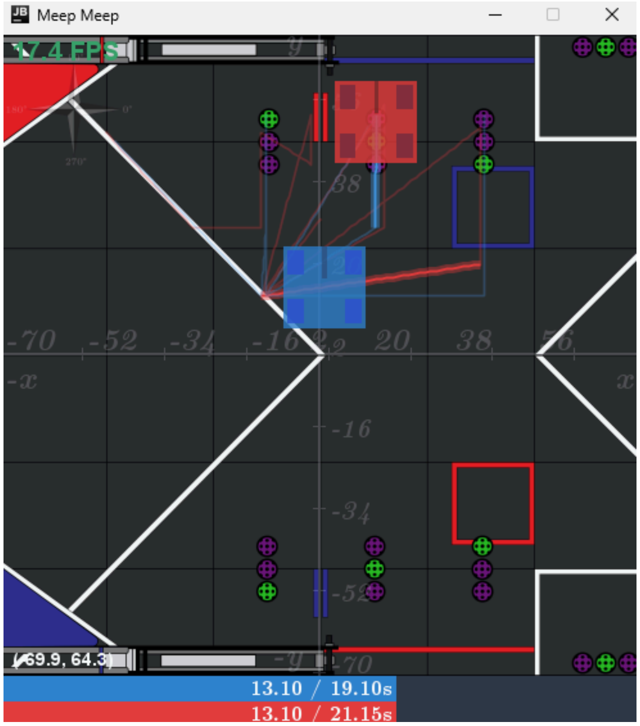
Between our tournament and states we have decided to invest in odometry which allows us to precisely track where we are on the field and our velocity, this allows us to easily calculate the angle need to aim our turret directly at the goal from anywhere on the field and allows us to compensate for our robots velocity when shooting the formula is ArcTan(target_Y - pos_Y, target_X - pos_X)

GAMEPAD 1 - MOVEMENT

GAMEPAD 2 - SHOOTING

AUTONOMOUS PERIOD

We use RoadRunner 1.0 and Meep Meep to most effectively PLAN AND EXECUTE OUR AUTONOMOUS. **we have 6 different autos we can run, depending on our aliance partner.** We use Roadrunner actions to effectivly communicate between systems when to start the next trajectories.



SOFTWARE

DRIVETRAIN

We have used both robot-centric and field-centric drivetrains in the past. however we found it more comfortable to use robot-centric for this last meet.

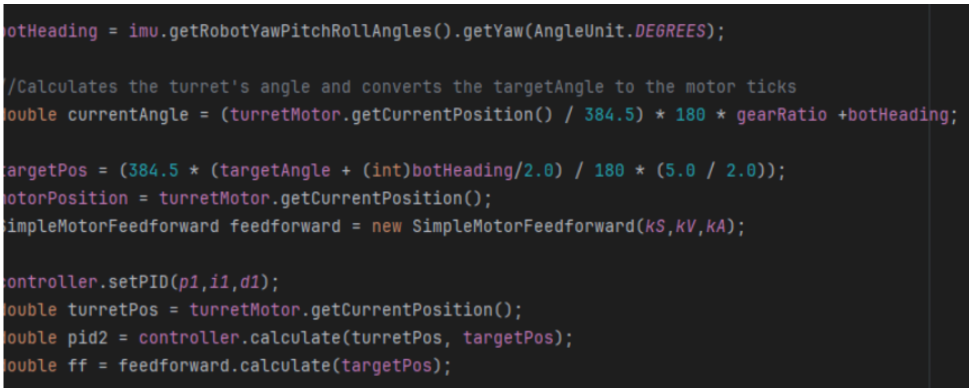
TURRET

- Our turret system works by using a combination of the motor encoder position, gyroscope from our IMU, and our angle from the April tag using our camera.

- We also added several saftey constraints: a dead zone at 160 degrres so we do not chew up our wires, as well as reset features for the current angle, target angle, and gyroscope.

- We use a PIDF control loop to tune how fast our turret can move while keeping a precise angle.
- We derived an equation to get the current angle of the turret by using the ticks of the encoder, our gear ratio, and gyroscope. We then rearranged the equation to get the target position the motor needs to go to.

- Additionally, we use our camera to get our bearing from the April tag, and override our input to stay locked on to the goal. **When we are aimed correctly, we use the rumble feature to let our drivers know when they can shoot.**



```
otHeading = imu.getRobotYawPitchRollAngles().getYaw(AngleUnit.DEGREES);

/Calculates the turret's angle and converts the targetAngle to the motor ticks
ouble currentAngle = (turretMotor.getCurrentPosition() / 384.5) * 180 * gearRatio +botHeading;

argetPos = (384.5 * (targetAngle + (int)botHeading/2.0) / 180 * (5.0 / 2.0));
otorPosition = turretMotor.getCurrentPosition();
impleMotorFeedforward feedforward = new SimpleMotorFeedforward(kS,kV,kA);

ontroller.setPID(p1,i1,d1);
ouble turretPos = turretMotor.getCurrentPosition();
ouble pid2 = controller.calculate(turretPos, targetPos);
ouble ff = feedforward.calculate(targetPos);
```

INTAKE

While intake is our simplest system, it is what allows everything to work in parallel with each other. We use our color sensors to detect when each ball is in position and automatically stop running. The launcher class also accesses the intake, so it will only push the balls up once our flywheel is up to speed. **Additionally, we use the rumble feature to let our other driver know when all 3 balls are loaded.**

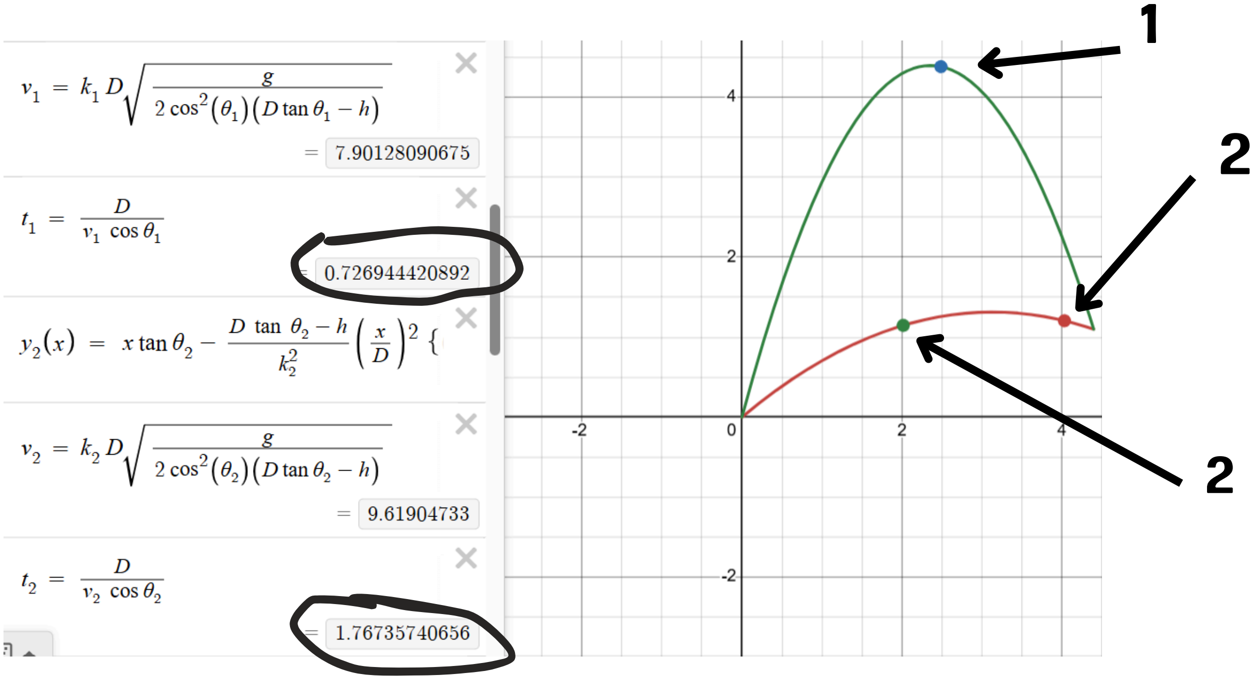
LAUNCHER

Our launcher system uses a velocity PIDF loop to quickly and accurately get up to speed. For launching, we use our camera to calculate our distance from the apriltag. we base the angle of our hood directly off this distance. We then derived a set of kinematic equations to determine the optimal launch velocity based on our distance and angle from the goal. This allows us to shoot from anywhere in the field. One problem we ran into is that our equations do not account for the loss of energy due to friction. To deal with this, we also use a lookup table to change OUR tuning constant based on where we are on the field.

$$v_1 = k_1 D \sqrt{\frac{g}{2\cos^2(\theta_1)(D\tan\theta_1 - h)}}$$

AIR-SORTING

To improve our capabilities during endgame, we developed a system to sort the artifacts mid-air. Using the previously mentioned equations, we can change the trajectories to increase or decrease time in the air. We use 3 color sensors to read what order our artifacts are in, and reference it to the motif. If the artifact is in the wrong position, we launch it with a high angle and higher velocity. If the artifact is in the correct position, we launch it from a low angle. While we have spent a lot of time on Air-Sort, we have not gotten consistent enough to use it during matches yet.



$$v_1 = k_1 D \sqrt{\frac{g}{2\cos^2(\theta_1)(D\tan\theta_1 - h)}}$$

$= 7.90128090675$

$$t_1 = \frac{D}{v_1 \cos\theta_1}$$

$= 0.726944420892$

$$y_2(x) = x\tan\theta_2 - \frac{D\tan\theta_2 - h}{k_2^2}\left(\frac{x}{D}\right)^2 \{$$

$$v_2 = k_2 D \sqrt{\frac{g}{2\cos^2(\theta_2)(D\tan\theta_2 - h)}}$$

$= 9.61904733$

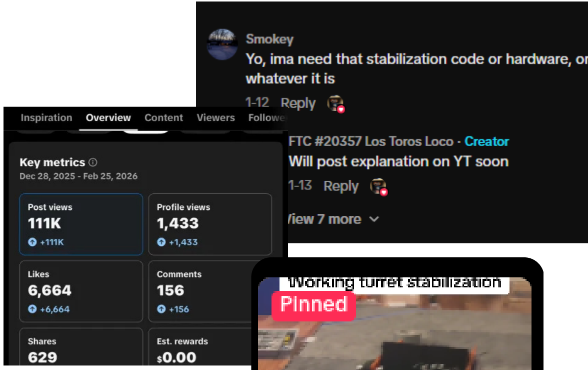
$$t_2 = \frac{D}{v_2 \cos\theta_2}$$

$= 1.76735740656$

OUTREACH

SOCIAL MEDIA

Once we felt confident in our robot's abilities, we decided to showcase our design to others by posting demos of our robot on TikTok, YouTube, and Instagram. Unexpectedly, one of our videos on TikTok gained popularity in the FTC and FRC community. Comments under our videos complimented our robot and provided feedback on what we could improve on.

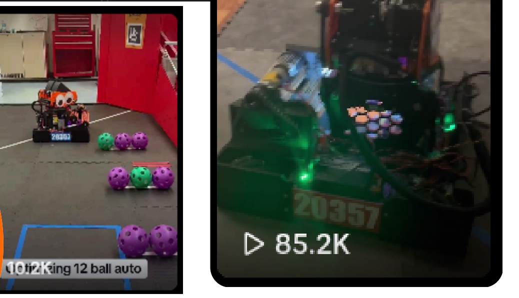

Smokey
Yo, ima need that stabilization code or hardware, or whatever it is
1-12 Reply

FTC #20357 Los Toros Loco · Creator
Will post explanation on YT soon
1-13 Reply

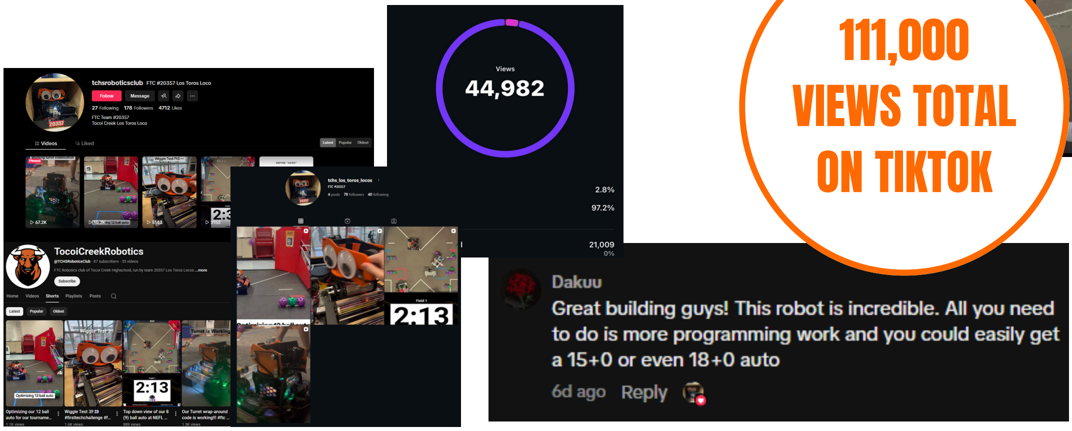
View 7 more

Key metrics
Dec 28, 2025 - Feb 25, 2026

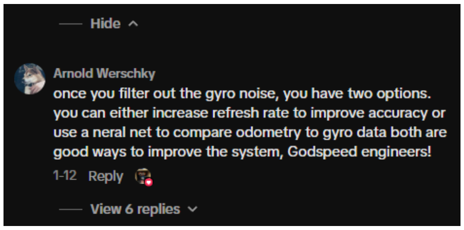
Post views 111K +111K	Profile views 1,433 +1,433
Likes 6,664 +6,664	Comments 156 +156
Shares 629	Est. rewards $0.00



111,000 VIEWS TOTAL ON TIKTOK



Dakuu
Great building guys! This robot is incredible. All you need to do is more programming work and you could easily get a 15+0 or even 18+0 auto
6d ago Reply

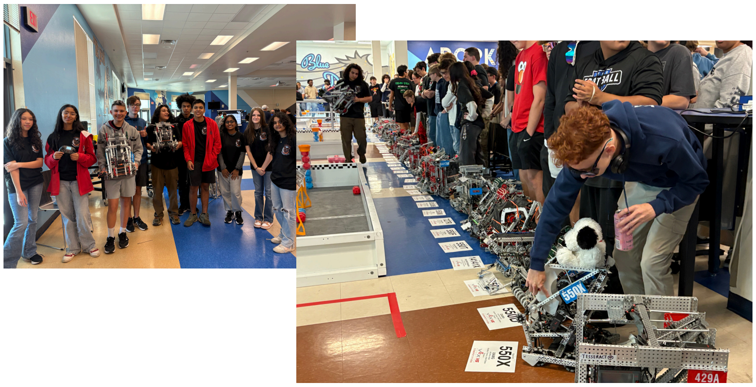

Hide

Arnold Werschky
once you filter out the gyro noise, you have two options. you can either increase refresh rate to improve accuracy or use a neral net to compare odometry to gyro data both are good ways to improve the system, Godspeed engineers!
1-12 Reply

View 6 replies

MENTORING VEX

As a school-based team, our school also offers VEX robotics as another activity for students. Knowing that our team had more experience in robot construction, our team members helped our VEX teams almost every day before school by providing insight on robot design choices and team organization.



COLLABORATION WITH 19916, WOLFPACK

X

After meeting 3, the Wolfpack reached out to our Instagram page offering to host practice sessions for competition at their school. Our team agreed on the alliance and went to their school to plan an auto that would integrate with our robots. Later on, we invited Wolfpack to our school in order to assist them with construction advice and software. Our collaborations outside of completions would hopefully prepare us for our matches.