7156

Wolves Robotics 2

Engineering Portfolio

Introduction

Who are we?

We are FTC Team 7156 Wolves Robotics 2 located in Goodyear, Arizona. We are the sister team of 5661 Wolves Robotics 1.

The wolves robotics have been around for about 15 years despite the year Covid 19 had happened when we did not compete. Our robotics team has become a big part of Estrella Foothills High School.

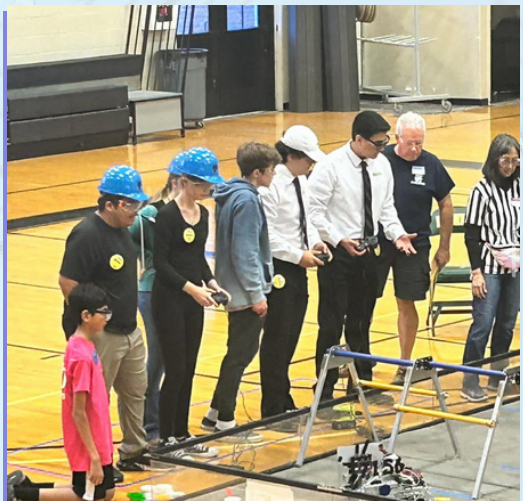
The 7156 Team consists of Freshman as well as Sophomore's with the exception of one junior. Since we are 5661s sister team that means they help as well as lead us in the right direction as new members continue to join the club.

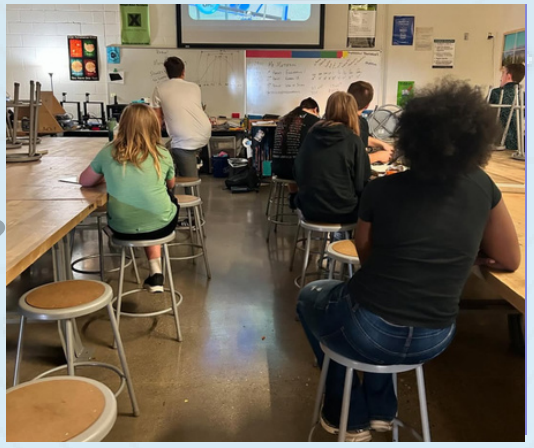
What makes our team special?

Our team is essentially a rookie team. That means when new members join the club, they get put on 7156 so that our mentor team can teach us. Since there's always new people joining it gives us a mix of people with different skills giving us a nice diversity when it comes to these skills allowing each member to work in tandem with each other and cover each other's flaws.

Work Ethic

For the members who show up they have a strong will to learn as much as they can. We jump at any opportunities to help out of learn something new from our 5661 team. It's good to have people who want to work and learn.





Meet the Team

Hope Mossberger 11th

I was on the build team and as a team, we went through a lot of trial and error. We worked through every issue we had with the robot.

Mattie Carrero 10th

Some ways I benefit the team is by showing up and making sure everyone stays on track. I do the portfolio with the help of the team and I'm more of a supervisor for them.

Sather Holmes 10th

I help with our coding. I also help out our newcomers with building and coding as well.

Lance Smith 9th

I help with building although we had to build peace's many times, I have been here almost all the time and at all most all events.

James Olson 9th

I was helping with the building and the CADing for the team. We all worked together very well and when an issue came up, we worked together to fix it.

John Avisov 9th

I helped designing the robot, troubleshooting mechanical errors. And getting materials for the builder to assemble our vision.

About our team.

The 7156 team is relatively small compared to some other teams, but we still make it work. We put in hard work while also having fun. It's not just about working it's about the friendships found in robotics and the future you can make for yourself.

We had everyone write a little about them and what all of our different roles are. It's the sophomores and juniors' job to help make this enjoyable for the freshman since it's there first time competing in **CENTERSTAGE.**

Club Finances

Carry Over	1400 $
Fundraising	400 $
Sponsorships	1500 $
Parts and Fees	-1275 $
Total Remaining	**2,025 $**

Last year, a parent helped establish our team's booster club to keep families informed and provide opportunities to support our team. The booster club also allows parents to utilize Tax Credit, so when they file their taxes, they can receive a refund for their contributions. The funds raised through the booster club help us bypass the PO process, enabling us to purchase new parts more quickly than we could through traditional funding methods.

Recruiting New Members

Currently, the majority of our team consists of Freshman and Sophomores. As we look toward the future, our primary focus is to recruit new members and share our passion for robotics, just as we were introduced to it. We believe that fostering a love for robotics starts with exposure and involvement, so we actively work to engage new students and bring them into our community.

To assist in this recruitment process, we host a variety of events throughout the year. These events are designed to raise awareness about our team and the exciting opportunities that robotics offers. Some of the key events include:

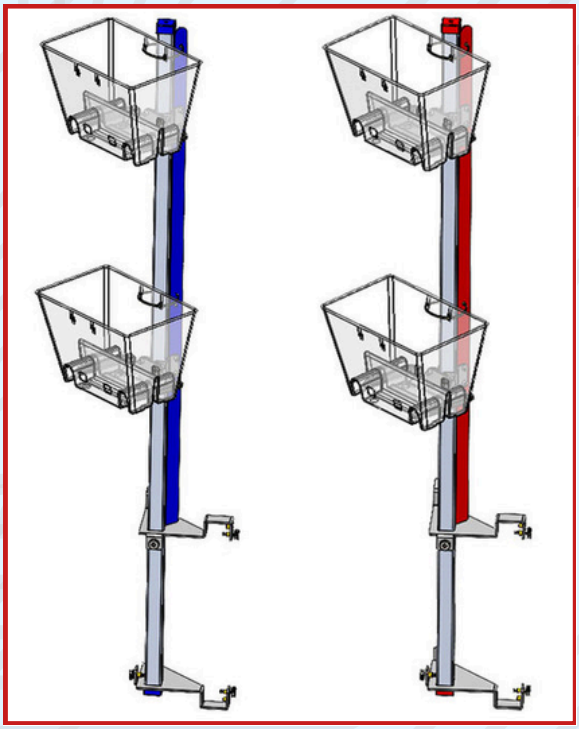
- **Freshman Gear Up**: An event specifically aimed at introducing freshmen to our team and getting them excited about the possibilities within robotics.
- **School Carnival**: A fun, community-focused event where we showcase our team and provide an interactive experience for students to learn more about robotics.
- **Club Rush**: A chance for students to explore all of the extracurricular activities available at school, with our team actively participating to encourage those interested in robotics to join.
- **Concession Stands**: These not only help raise funds for the team but also serve as a way for us to engage with the wider school community and promote our team to potential new members.

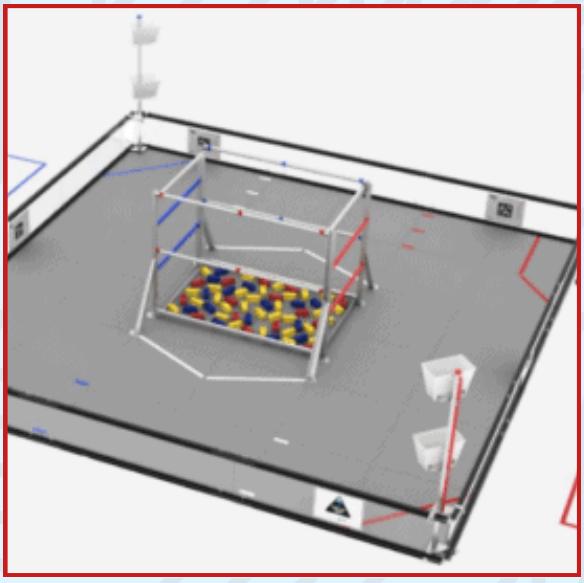
Through these events, we hope to inspire the next generation of robotics enthusiasts and continue to grow our team for years to come.

Game Plan

Scoring Points

At the moment, our robot is not equipped to reach the high net, but it is fully capable of targeting and scoring in the lower net. Our strategy is to drive the robot up to the scoring area and carefully place a specimen into the lower net, allowing us to accumulate points. Although we're currently limited to the lower net, we are refining our technique to maximize efficiency and ensure consistent scoring throughout the competition.



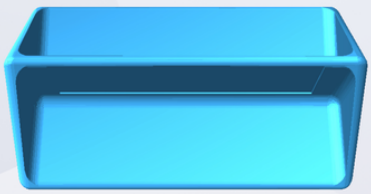


The Hang

We are still exploring the best method to hang the robot. While we've tested several ideas, none have been successful so far. One possibility is hanging from the lower bar, but we are still uncertain if this will work as planned.

Drive Team

Our drive team plans to focus most of our scoring on the bottom net. We also have the ability to hang specimens on the side. However, we're still in the process of getting up to speed, as this year's drive team is composed entirely of new members. While we may not have a lot of experience yet, we're committed to improving and refining our strategy as the season progresses.



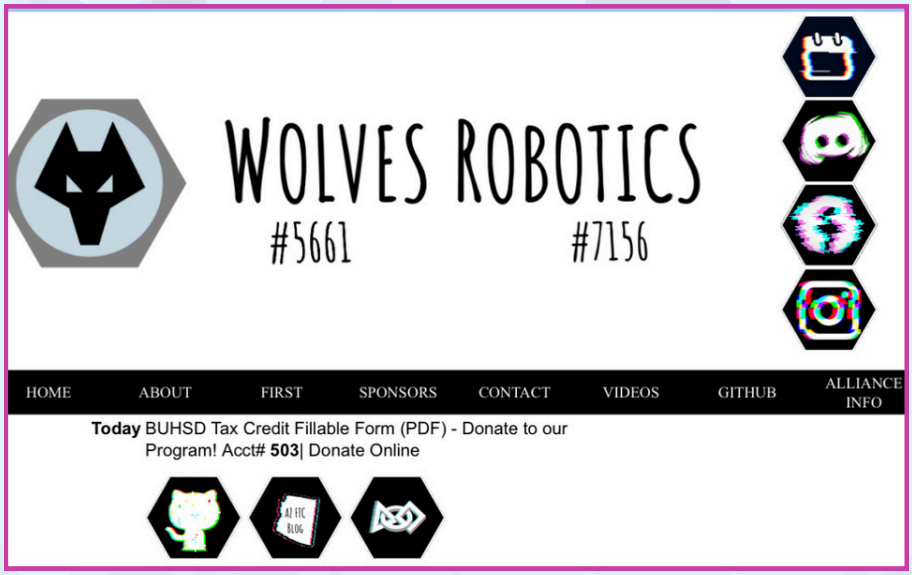
Outreach

Club Website

Our club website serves as a central hub for both the 7165 and 5661 teams. It provides a wide range of valuable resources, including:

- Team portfolio
- CAD files
- Contact information
- And much more!

The website is designed to keep our teams organized and informed, offering easy access to essential materials that support our ongoing projects and communication.



St. Mary's Food Bank

A total of 1,892 individuals were provided with meals thanks to our team's efforts. We had the privilege of partnering with the Interact Club to prepare emergency food boxes for those in need. Each food box contained enough supplies to sustain two people for an entire month, offering much-needed relief to families facing challenging circumstances. Through this collaboration, we were able to make a meaningful impact in our community, ensuring that those who are struggling have access to essential nourishment.

Westar Elementary S.T.E.M. Camp

Our team had the opportunity to participate in the Westar Elementary STEM Camp, where we led a dedicated robotics section. Throughout the camp, we worked closely with students ranging from kindergarten to 6th grade, guiding them as they built and controlled robots using VEX kits. In addition to hands-on robot-building, we introduced them to the engineering design process, helping them understand the key concepts behind problem-solving and innovation in robotics.

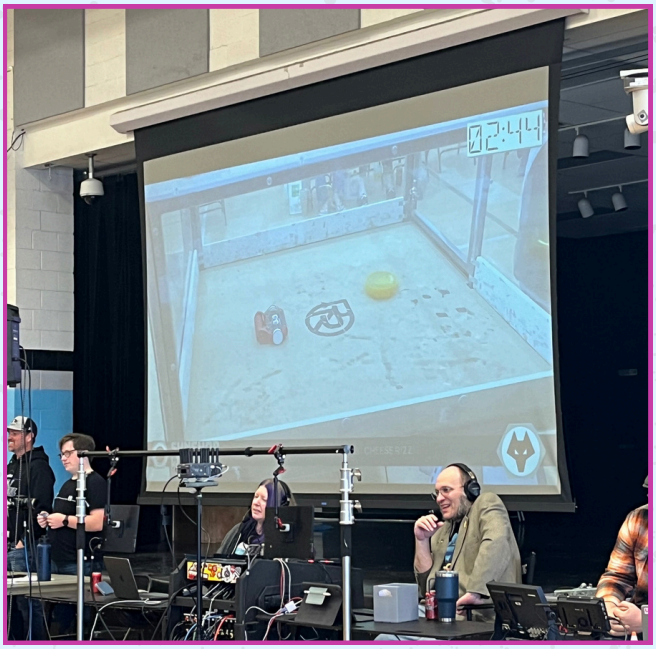
Outreach

Girl Scouts Collaboration

During the off-season, we had the wonderful opportunity to collaborate with the Girl Scouts and assist them in earning their robotics badge. We guided them through the process of building a LEGO Mindstorms robot, introducing them to basic robotics concepts. Once the robots were completed, the Girl Scouts tested their creations through a variety of fun and engaging challenges, including obstacle courses, races, and freight delivery tasks. This experience allowed them to apply what they had learned in a hands-on way, while also sparking interest in STEM and robotics.

Guest Speaker: Kelly from NASA

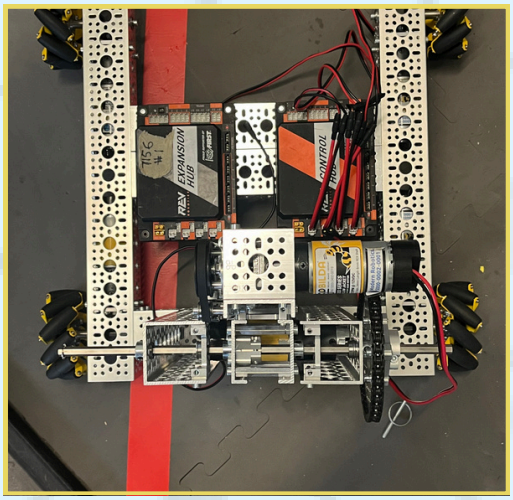
On February 19th, Kelly, a mentor for the team Testing is Optional, visited an engineering class to discuss his work with NASA, airplanes, and robotics. Kelly has experience as a flight systems engineer at NASA. During his talk, he covered a range of topics, including post-stall maneuvering, how the Mach number is affected by atmospheric temperature, the “Suck Squeeze Bang Blow” cycle, and the Lunar Lander Research Vehicle. These were just a few of the fascinating subjects he shared with the class.



Wolves Combat Classic

We are actively involved in combat robotics, a competitive event where teams design and build small robots to battle each other. These robots are primarily 3D-printed, making them lightweight yet extremely durable. The competition takes place in an enclosed arena, where the robots go head-to-head in a series of intense matches. During the fights, robots can use various strategies, including pinning their opponent for up to 10 seconds, which is a key tactic to earn points and gain an advantage.

Robot Build

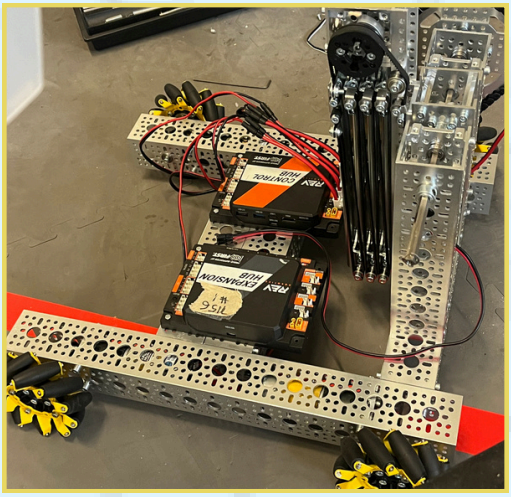


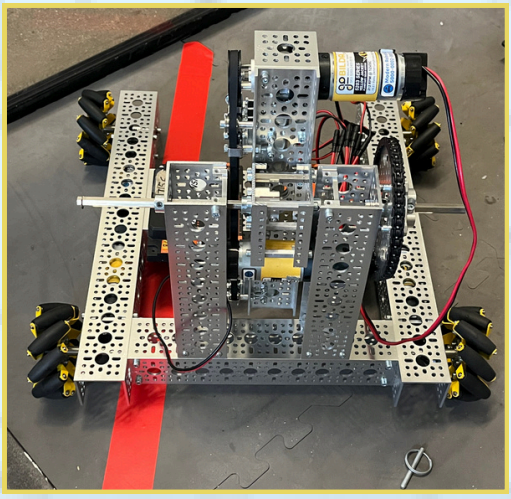
Arm

The arm is equipped with a small platform designed to prevent it from scratching against the middle support motor. Without this platform, constant contact could lead to wear and tear, which would become problematic after repeated movements—potentially affecting the motor's performance over time. By adding this platform, we not only protect the motor but also provide a slight increase in height, ensuring smoother operation and preventing any long-term damage that could result from frequent contact.

Chassie

The chassis is based on the standard GoBuilda design, with a small modification added to improve functionality. This modification includes a small platform designed to securely hold both the GoBuilda hub and the extension hub. Additionally, we came up with the idea to place the battery within the supports of the chassis. This adjustment helps save valuable space on top, allowing us to allocate more room for other essential components. While the battery remains a crucial part of the robot, this arrangement enables us to optimize the layout and make room for more important systems.



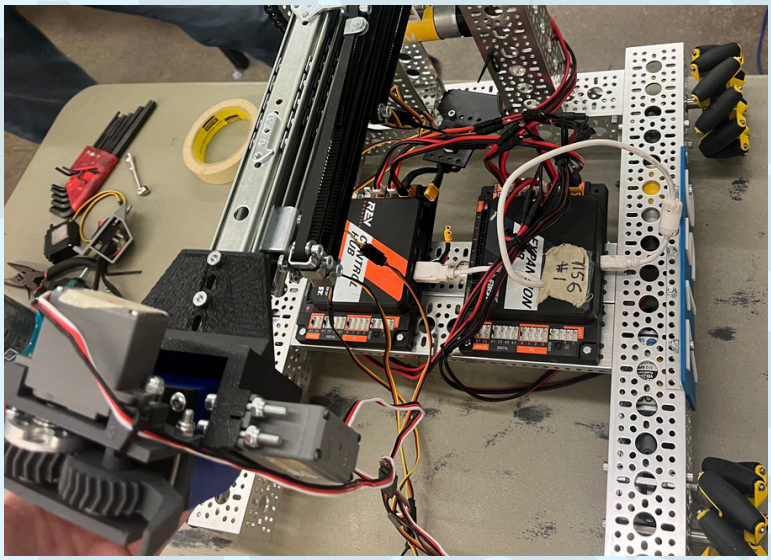


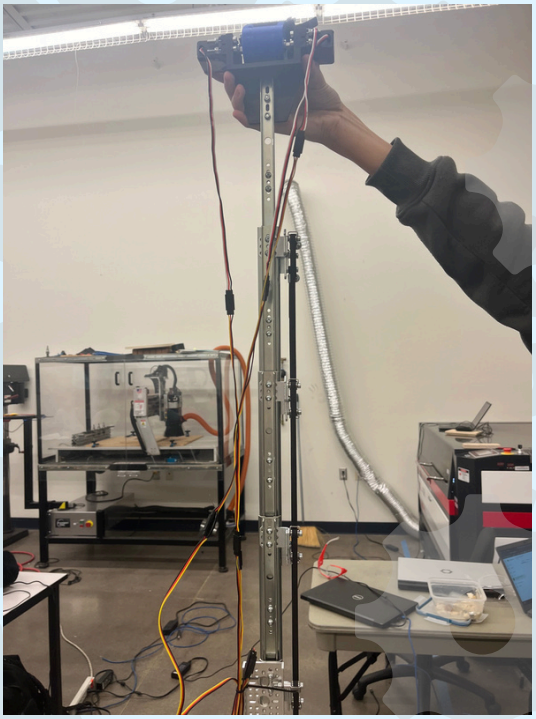
Middle

The middle supports were initially too tall, which posed a potential issue as they needed to be shortened to avoid exceeding the height limit and risking disqualification. To address this, we made the necessary adjustments, ensuring that the arm now stays just under the height limit. Additionally, the other dimensions of the robot are within the required specifications, and it fits together well with some extra space remaining for ease of movement and future adjustments.

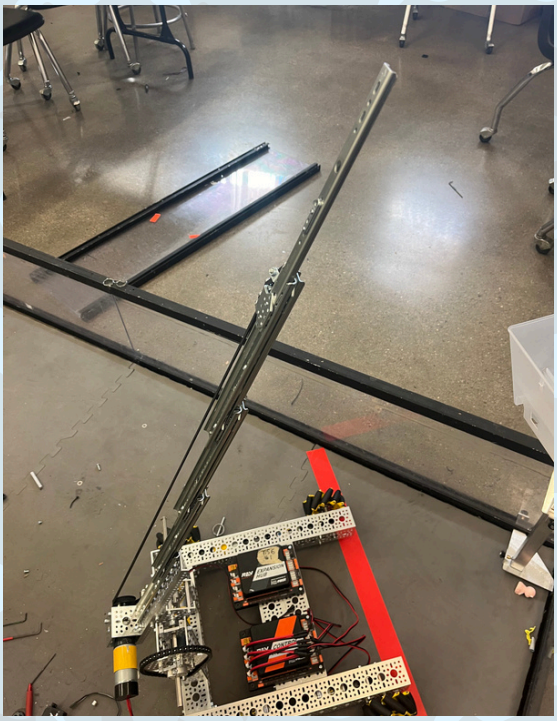
Arm

We designed a Viper linear slide that measures 240 mm in length, after conducting research to identify the strongest and lightest options available. While lighter linear slides offer ease of movement, we found that they tend to be weaker compared to heavier, stronger slides. Our original goal was to lift the entire robot to maximize point potential, but we encountered a challenge: the linear slide interfered with the placement of the hooks necessary to lift the robot. As a result, we need to reassess the design to find a solution that allows for both strength and functionality without compromising the lift mechanism.





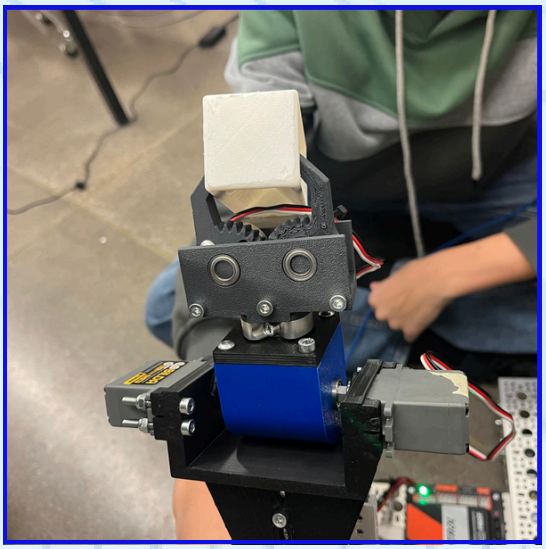
The height of the arm when fully extended is approximately 260 mm, but it is still not sufficient to reach the tallest basket. To address this, we plan to extend the arm slightly in order to ensure it can reach the highest basket.



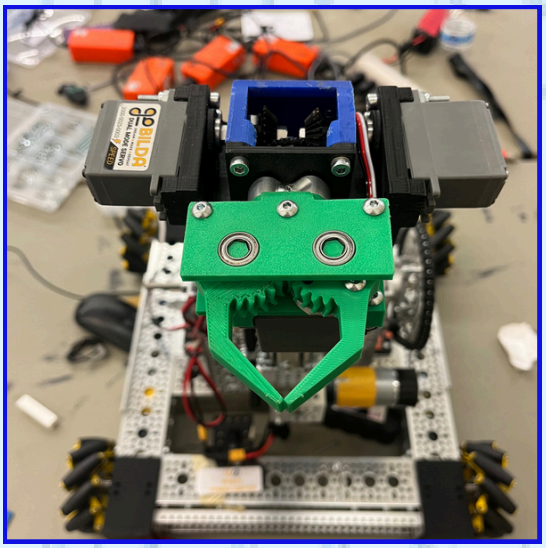
The hook is currently too large, which causes it to interfere with the claw, preventing the arm from fully retracting and staying out of the way. This also affects the functionality of the hooks, making them unable to operate correctly. Additionally, the wires need proper connections to ensure they function as intended.

Claw

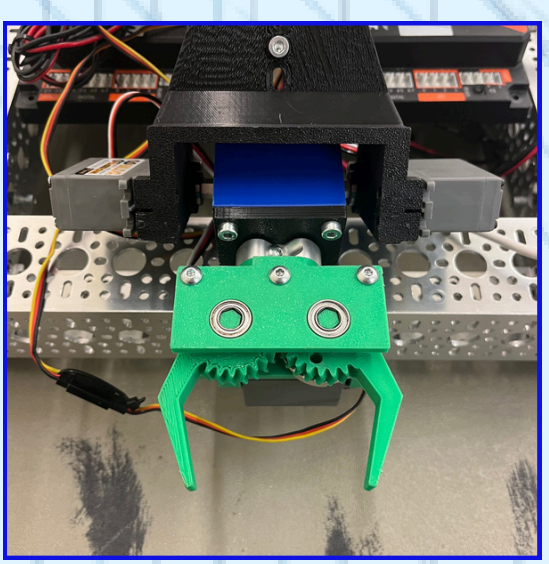
A claw grabbing device is typically controlled by a motorized mechanism designed to open and close around a block to pick it up or release it. The claw we use has a mounted servo that controls the open and closed mechanism. The claw was integrated into an OpMode to open, close, or even hold the block, and the motor or servo can be controlled dynamically during the match based on sensor input, user commands, or other factors to ensure accurate and reliable block handling.



A rotating arm that picks up blocks using a bevel gear system relies on a motor to drive the motion through gears arranged at an angle. The bevel gears transfer rotational motion from the motor's shaft to the arm, which is mounted on another shaft. In this setup, the bevel gear system physically transfers the rotational motion from the motor to the arm. While the bevel gears affect the speed and torque of the arm, they don't require changes to the code, as the system operates mechanically.



The bevel gears are used to transfer rotational motion from the motor along a 180-degree angle to control the rotation of the arm or mechanism. The system is designed to rotate continuously by allowing the motor to drive the bevel gear, which in turn moves the arm 360 degrees. a linear actuator or a second motor is used, either connected to the same system or to a parallel mechanism, allowing the arm to raise and lower. , this is controlled by setting power values for the motors.



CAD Team Number

The Design Process

The design process for the sign was challenging and time-consuming. The numbers took a lot longer to position on the rectangle than expected, and aligning the holes perfectly was equally frustrating. Despite the difficulties, we persevered and successfully completed the sign.

Fitting the Sign

Fitting the sign took time, but thanks to our past experience, we completed it much faster than usual. We had to align the holes on the sign with those on a bar, and when they didn't line up, we made adjustments to ensure a perfect fit.

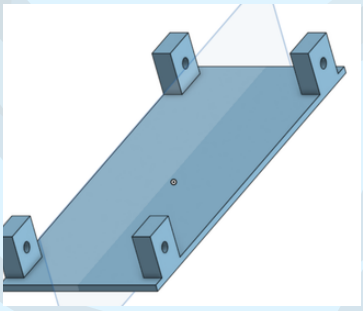
The Final Product

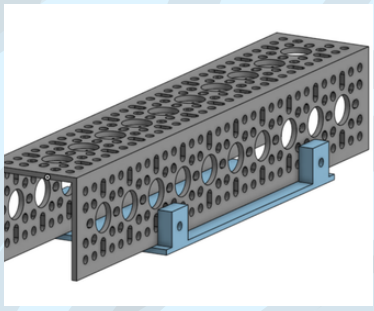
The final design of the sign is a perfect match for our robot. It features a clean color scheme of red and blue, with crisp white numbers on both sides, creating a striking visual contrast. While we faced challenges during the design process, these obstacles provided valuable learning experiences. We gained a deeper understanding of CAD design and improved our skills in aligning components to achieve a precise, polished result.

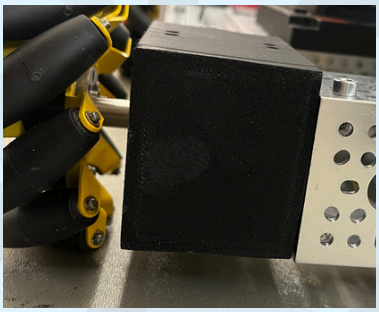
CAD

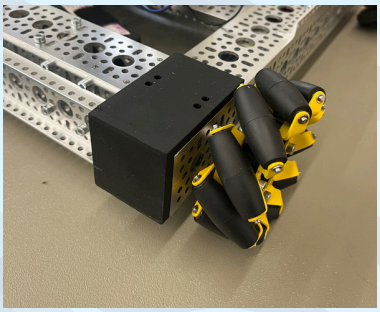
Battery Holder PT1

"We initially designed the battery holder to securely hold the battery beneath the robot, utilizing a U-channel for a stable fit. However, during testing, we encountered an issue where the holder would slip off, compromising the security of the battery. To resolve this, we re-engineered the design with a focus on improving the hold and preventing any slipping. The new design ensures a more secure fit, providing better stability and reliability, so the battery stays in place even during rigorous movements."







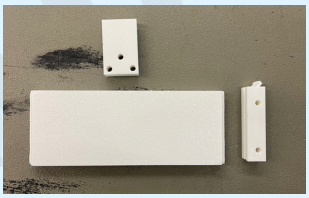


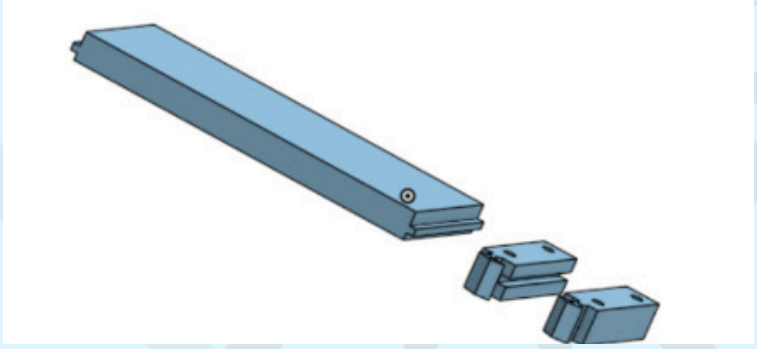
Wheel Covers Design

Our original wheel covers were designed to solve a common issue we faced with blocks getting trapped under our robot during operation. To address this, we developed custom covers that prevent debris from interfering with the movement. However, we soon discovered that the first iteration was too thin and prone to snapping under pressure. To improve durability, we reinforced the design by making the covers thicker, ensuring they can withstand the demands of the robot's environment.

Battery Holder PT2

"We encountered several challenges with our previous battery cover design, particularly when it came to removing the battery. To address this, we developed a new sliding mechanism that simplifies the process. This innovative solution allows the battery to slide out effortlessly, ensuring smoother operation and greater convenience for users. The new design not only improves functionality but also enhances ease of access, making it quicker and more efficient to replace or remove the battery when needed."





Software

Claw

Programming a claw involves controlling a motor or servo that manipulates the claw's opening and closing actions. A servo motor can be used for more precise control, where the servo's position is set to specific values to open or close the claw to the desired angle. Triggers can be mapped to adjust the servo or motor's position, enabling smooth and controlled operation of the claw.

Arm

Controlling an extending arm typically involves interfacing with motors or servos, depending on the arm's design. We can control its extension and retraction by setting the motor's power based on input from the gamepad, such as using the triggers to control the direction and speed. An example will be the right trigger extends the arm, and the left trigger retracts it.

Programming an extending claw typically involves controlling a motor or servo that actuates the claw mechanism, allowing it to open and close or extend and retract. Using Java, the motor or servo can be controlled by mapping inputs from the gamepad to the motor's power or the servo's position. programming wheel movement involves controlling the robot's motors, which drive the wheels for forward, backward, or rotational motion. The gamepad can be used to adjust the motor power or to map joystick inputs to control the robot's speed and turning. For our robots arm, torque and gear ratios were used for arm movement. Torque and gear ratios is crucial for optimizing the performance of motors, especially when dealing with heavy loads or requiring specific speed and power outputs. A higher gear ratio increases torque but reduces speed, which is useful for applications requiring more force, such as lifting mechanisms or moving heavy objects. To account for the gear ratio in programming, we adjusted motor power dynamically or incorporate motor encoders to ensure that the movement is consistent with the desired torque and speed, while considering the physical gear setup.

Problems

Procrastination

Our team often faces challenges with staying focused and maintaining consistent progress. We have a tendency to put off tasks until the last minute, which leads to unnecessary stress and affects our overall productivity. By delaying important tasks that should be addressed earlier in the process, we create avoidable pressure and risk compromising the quality of our work. We recognize this issue and are working to improve our time management and prioritization in order to be more efficient and effective moving forward.

CAD/Robot Build

During the CAD and robot build process, we encountered a number of challenges. One of the main issues was parts not fitting as expected with the CAD model, requiring us to make adjustments and rework the design. The chassis also presented several complications that slowed our progress. Additionally, when we started assembling the body of the robot, we ran into difficulties with one of the wheels—it was particularly stubborn and wouldn't fit properly onto the robot. Despite these setbacks, we remained determined to troubleshoot and find solutions to keep the build on track.

Claw/Chassis

Our initial design for the claw mechanism was intended to pull objects into the bucket efficiently. However, the first version did not perform as expected, so we decided to redesign it and 3D print a new version. Despite our best efforts, the updated claw still failed to meet the necessary specifications, which led to additional challenges in our build process. Recognizing the need for further refinement, we are currently in the process of reprinting the claw with the required adjustments to ensure it performs as intended and meets the functional needs of the robot.

Linear Slide

The linear slide presented several challenges during the build process, primarily due to our reliance on outdated manuals and issues with broken or faulty parts. These setbacks led to confusion when the mechanism didn't function as expected, causing us to repeatedly disassemble and reassemble it in an attempt to troubleshoot. Despite these frustrations, we remained focused on resolving the issues and are now working to update our resources and replace the damaged parts to ensure proper functionality moving forward.

Solutions

Solution for Procrastination

To address procrastination, our team can proactively divide the workload at the outset, ensuring that everyone is clear on their responsibilities. If anyone encounters difficulties or needs assistance, they can easily reach out to a teammate or mentor for support.

CAD/Robot Build Solution

To address this, we revisited the design files, double-checked measurements, and identified the specific areas where adjustments were needed. We're now in the process of refining the CAD model to ensure better precision and compatibility with the physical components.

The chassis also presented a number of complications that delayed our progress. After troubleshooting the alignment and making necessary tweaks to the frame, we were able to improve its fit and functionality. We also encountered issues while assembling the robot's body, particularly with one stubborn wheel that refused to fit properly. To solve this, we carefully examined the wheel mount and made minor modifications to both the part and the assembly process to ensure a smoother fit.

Despite these setbacks, we have remained committed to finding solutions and moving forward. By continually refining our designs, improving our parts, and working collaboratively, we are confident that we can keep the build on track and meet the specifications required for the robot to perform optimally.

Claw/Chassis Solution

To resolve these issues, we are currently re-evaluating the design, focusing on critical factors like size, material strength, and alignment to ensure a better fit and enhanced functionality. We plan to incorporate feedback from our testing phases and work closely with the team to refine the design. This includes using stronger, more durable materials for the claw and ensuring that the mechanical connections are more robust to handle the forces at play. We are also considering adjustments to the chassis to improve the integration between the claw mechanism and the robot's structure. By reprinting the claw with these necessary improvements, we aim to ensure it functions as intended and meets the robot's operational needs.

Linear Slide Solution

During the build process, we encountered several challenges with the linear slide, mainly due to outdated manuals and faulty or broken parts. These issues caused confusion when the mechanism didn't function as expected, leading us to disassemble and reassemble it multiple times in an attempt to troubleshoot. To address this, we have taken several key steps to resolve the issues:

1. Manual and Documentation Update
2. Part Replacement
3. Testing and Refinement

Improvements/ Accomplishments

A Plan of Action

Our goal is to improve the robot ahead of our next competition, ensuring it performs at its best. One of the key areas we aim to address is the claw mechanism. We want to redesign it so that it doesn't place excessive pressure on the robot's arm, as even the smallest amount of force currently seems to threaten tipping the robot over. This is a critical issue that we are focused on resolving to ensure better stability and functionality.

In addition to refining the robot's design, we also want to foster better collaboration within the team. It's important that everyone works together efficiently to achieve our goals, and that we avoid the last-minute rush to complete tasks. Our plan is to allow ourselves more time for improvements, testing, and troubleshooting so that we can make the necessary adjustments before the competition. By adopting this proactive approach, we aim to enhance both the quality of our work and our overall performance.

Accomplishments

At 1756's team first qualifier, we were selected to represent our state. We earned 3rd place in the Inspire Award for our communication about the program. Our team collaborated effectively, and we were able to discuss our outreach efforts in detail. Additionally, we had the opportunity to showcase our code to the judges.

Communication

Effective communication is a skill that we can always improve, and we recognize the importance of continuously working toward bettering it. There is always room for growth, and taking steps to improve communication is crucial for the success of our team. One of our main goals is to recruit new members, but effective communication is key to achieving that. Without clear communication, it's difficult to reach out and engage others.

We also face challenges with staying focused at times, which can lead to distractions and a lack of direction. When this happens, communication becomes even more essential. Improving our communication will not only help us stay focused but also strengthen our ability to collaborate and work toward our goals efficiently.