Team 7341

F.R.E.N.C.H. F.R.I.E.S.

Friendly

Reliable

Energetic

Nerdy

Classy

Heroes

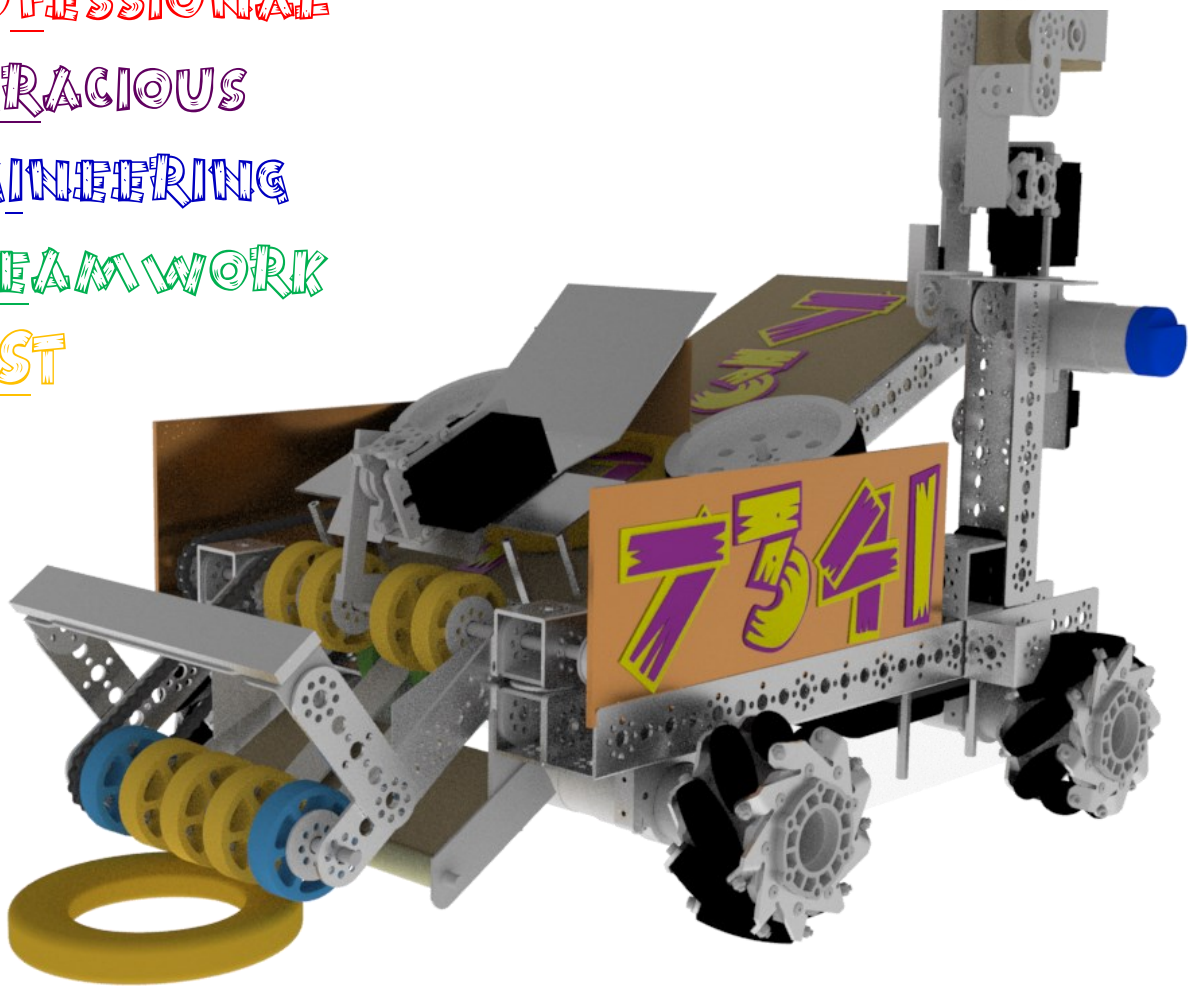
Professional

Gracious

Engineering

Teamwork

First




Signature : Shelby

Date: April 16, 2021

Team 7341

F.R.E.N.C.H. F.R.I.E.S.

# Our Team

We are Team 7341 - F.R.E.N.C.H. F.R.I.E.S. (**F**riendly, **R**eliable, **E**nergetic, **N**erdy, **C**lassy, **H**eros, pro**F**essional, g**R**acious, eng**I**neering, t**E**amwork, FIR**S**T). We are a Girl Scout team and this year we have 5 members who attend different schools in different cities .

Two of the us attend schools in Titusville (Astronaut High School, and Virtual School). One of the us attends a school in Port St. John (Space Coast Jr/Sr High), another of us attends a school in Rockledge (McNair Middle School) and last one team member attends a school in Merritt Island (Edgewater Jr/Sr High). The girls are also member of different troops within the Ohana Girl Scout Community. As Girls Scouts we believe in sharing our knowledge with others and making the world a better place. Two of our team members started their FIRST journey as members of our sister FIRST LEGO League Jr. **B.E.E.s** team, which then they joined the FIRST LEGO League **C.A.K.E. B.A.T.T.E.R.S** team. Two of our team members moved up from the FIRST LEGO League **C.A.K.E. B.A.T.T.E.R.S** team. Our Senior joined us when she started High School. We will miss her as she finds greater things to be part of next year.

Our team's biggest obstacle are to overcome the fear of programming, driving the robot and being able to meet during this global pandemic. Our coach did have a few out of state trips where we could not work on the robot or practice driving. We also have troubles driving and picking up the rings under time pressure. This is something we need to work on.

After we started to meet in person some of the girls could no longer attend. We are hoping they return next year. Extra hands on a team is always better.

Catching up with each other and keeping in touch with our parents is an important thing, especially since the girls do not live near each other.

Signature : Shelby

Date: April 16, 2021


I'm in 7th grade at McNair Middle School. I am polygender. I love cosplaying and drawing. I was born at a very young age. I started girl scouts in 3rd grade. I am a cheddite. This is my second year as a member of the FIRST Tech Challenge Team 7341, where I help build the robot and participate as the human player or coach. I started as member of the FIRST Lego League C.A.K.E. B.A.T.T.E.R.S. Team for 4 years.

## Ashlynn (Ash)

**I am in 8th grade at Edgewood. I have been in Girl Scouts for 9 years. I participated in the FIRST LEGO League Team 7407 C.A.K.E. B.A.T.T.E.R.S. prior to joining FIRST Tech Challenge Robotics Team 7341. This is my second year participating, where I help build and control the attachment on the robot.**

## Harper

**I am in 8th grade at Florida virtual schools. I have been in Girl Scouts for 10 years. I have been in the FIRST Family since FIRST LEGO League Jr. where our Team 4323 - B.E.E.s went to World Competition in St. Louis. I participated in the FIRST LEGO League Team 7407 C.A.K.E. B..A.T.T.E..R.S. prior to joining FIRST Tech Challenge Robotics Team 7341. This is my second year participating, where I help build and drive the robot.**

## Shelby

**I am a Senior at Astronaut High School. This is my 5th year in FIRST Tech Challenge Robotics, where I help build and work the attachments on the robot. I am a member of a Girl Scouts Troop 1703. Being in robotics is important because it teaches me a lot about robotics, engineering and other life skills. We try to learn something new every robotics meeting. As a member of the team I am always ready to do outreach activities to let others know about FIRST Robotics.**

## Tempy

**I am in 8th Grader and attend Brevard Virtual School. I love to cook new things and I am in a Girl Scout Troop that is very active. I have a goal of selling 3000 boxes. I have been a member of the FIRST Family since FIRST LEGO Jr. where our team went to WORLD competition in St. Louis. As a member of the team I am always ready to do outreach activities.**

Signature : Shelby

Date: April 16, 2021

TEAM 7341

F.R.E.N.C.H. F.R.I.E.S.

# Thank-you Sponsors

LOCKHEED MARTIN

Connect Create Collaborate Care Contribute

girl scouts of citrus

Our journey begins with a budget and the search for grants. We have been very fortunate to receive the following grants: NASA, and Lockheed. The Girl Scouts of Citrus allow us to use the FTC parts they had from a previous team. We were very fortunate last year to have received special scholarship from the sister's of a NASA Employee that work with robotics and still had some money left from two years. Thank you to all our supporters. An additional thank you goes out to Helpertunity, Inc. for their paying it forward grant money when they did an upgrade to their website. We would like to thank all our supporters.

We would also like to thank Mr. Louis for all the help in building our special parts for our robot.

# Our Mentors

**Miss Caroline**

(coach)

**Mr. Louis**

**Miss Emily**

**Miss Chelsea**

Signature : Cailyn

Date: April 16, 2021

# Team Success Plans

| Strategy | Actions | Responsibility | Planned |
|---|---|---|---|
| Prepare the Team to learn JAVA | Teach the girls the JAVA | Team Mentor | June 2020 |
| Plan and implement STEAM Activity day | Get girls interested in STEAM careers | Team Mentor | April 2020 |
| Work with the B.E.E.s and C.A.K.E. B.A.T.T.E.R.S. | Keep the girl interest in robots so they would want to move up | Team Mentor | Continual |

## Introduction

We currently have three robotics teams that support each other. The girls start out participating on Team B.E.E.s (FLL Explorer Team) , next would be Team C.A.K.E. B.A.T.T.E.R.S (FLL Challenge Team) and moving up to Team F.R.E.N.C.H. F.R.I.E.S. (FTC). Note you do not have to participate is all three, but are encouraged to continue once you have started.

Team 4323 - B.E.E.s— FIRST® LEGO® League Explorer program.
Team 7407 - C.A.K.E. B.A.T.TE.R.S.- FIRST® LEGO® League Challenge program.
Team 7341 - F.R.E.N.C.H. F.R.I.E.S.—We are a Girl Scout team of 1 High School student and 4 Middle School students who attend different schools in Brevard County and we are based in Titusville, Florida. We have participated in the FIRST® Tech Challenge program for the last 8 years, and is ever changing as the girls' progress through school and graduate. With the skills that we have learned as a team our graduating seniors are ready to conquer any challenge they meet out in the world.

## Mission Statement (All Levels)

To build a world class model or robot, create an engineering notebook, and spread the word about robotics and the new skills they obtain in our schools and community, to promote FIRST and STEAM learning activities as we expand our knowledge.

## Recruiting Team Members (All Teams)

We recruit new team members using the following guide-lines:

- Must be a or want to join Girl Scouts
- Must be interested in learning new things
- Must be willing to work hard
- Must want to have fun
- No previous robotics experience necessary


Blast from the past


All hands on deck

## F.R.E.N.C.H. F.R.I.E.S. Links

- Team Website: http://girlscouteverywhere.org/frenchfries/

## Social Media

- Facebook: https://www.facebook.com/groups/754597614555375/
- Twitter: https://twitter.com/ FTC_FRENCHFRIES
- Instagram: http://instagram.com/frenchfries

Signature : Shelby

Date: April 16, 2021

| Team 7341 - F.R.E.N.C.H. F.R.I.E.S. | | 2020-2021 Budget |
|---|---|---|
| Category | Estimate | |
| | Income | Estimated Income Notes |
| Grants | | |
| | | |
| NASA GSDO | $2,028.00 | Competitive Edge Grant |
| Lockheed Martin | $ 750.00 | Competitive Edge Grant |
| | $ 300.00 | Helpertunity Gift |
| Total | $3078.00 | |

| Fundraiser Idea | Projected Income | Category | Notes |
|---|---|---|---|
| Panda Express | $200.00 | Fundraiser | One-time fundraiser |
| Hosting a Meet | $720.00 | Fundraiser | One-time fundraiser/shared |
| STEAM Event | $200.00 | Fundraiser | Set up to be an annual event for the Girl Scout in the area |

Following is the "Cost To Rebuild" the Robot if there is an accident where we could not recover.

| | Description | Total |
|---|---|---|
| | | |
| 1 | Electronics Components | $1084.00 |
| 2 | Hardware Components | $1010.95 |
| 3 | Motors Components | $300.00 |
| 4 | Servo Components | $180.00 |
| 5 | Raw Materials to make in-house Components | $100.00 |
| | **Total** | $2504.00 |
| | | |


Signature : Harper

Date: April 16, 2021

TEAM 7341

F.R.E.N.C.H. F.R.I.E.S.

# Inspiring Others

Our Outreach has been limited to inspire others because of the world wide pandemic. We did not get to attend our usual events to showcase our robot and let the public know how Princess Charlie works because they were all canceled. We did get out to a few cookie booths in the Titusville and Melbourne area during the month of March. We did manage to get out just before the pandemic at a LEGO Event held in Melbourne, FL. We

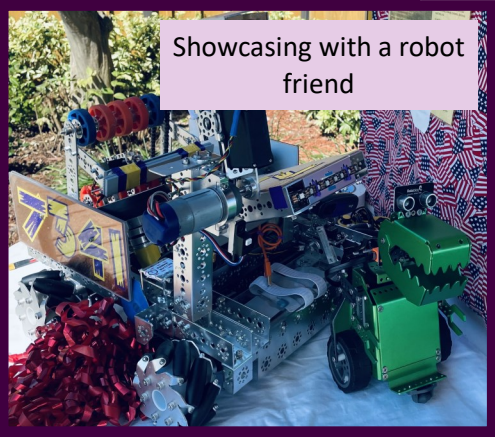
We have shared different parts of our robot's journey online through Facebook posts, Twitter tweets and Instagram. Our Ftcfrenchfries Instagram account has 1241 followers while following 1591 Groups. Our @FTC_FRENCHFRIES Twitter account has 1480 Followers while following 2026 groups. Our Facebook and website are open so all the public can see the information we are sharing.



We helped with the Girl Scout "Dinner in a Bag" project for our local Veterans so they have a great meal for the Holidays. We help distribute the food to 25 different families.







Showcasing with a robot friend


Traveled to Melbourne and supported a Girl Scout Cookie Drive Through while talking about FIRST.

Signature : Harper

Date: April 16, 2021

TEAM 7341

F.R.E.N.C.H. F.R.I.E.S.

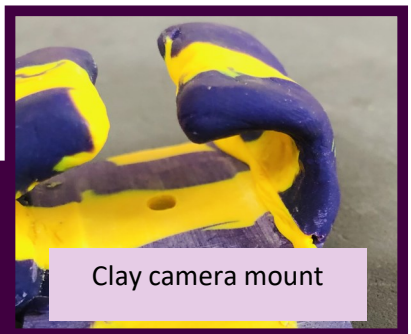
# Engineering Design

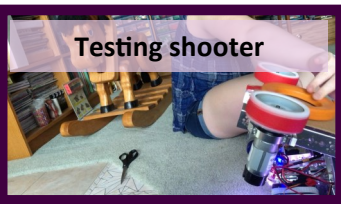
We reviewed several different videos after the reveal and found that we like the simplistic straight-through design. This design is to pickup the rings from the back and shoot them out the front of the robot. We dissembled last years robot down to the drive train and started to add the elements to the robot that would shoot the rings, then the arm to move the wobbler and finally pick the rings off the mat. The robot's construction uses the following hardware items:

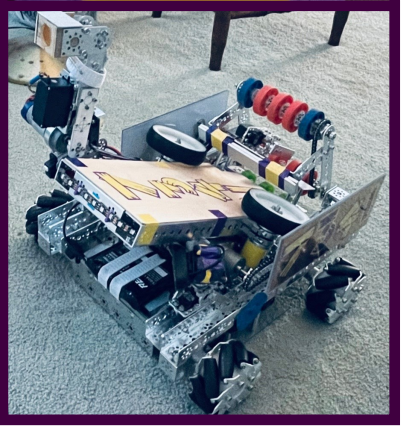
- Eight (8) motors, where the 4 Drive Motors have encoders for running autonomous, 1 to raise and lower the arm and 1 to pick up the rings and two to shoot the rings
- Three (3) servos: 1 to hold the wobbler, 1 to move the camera and 1 to push the ring into ring shooter.
- Two (2) touch sensor which are used to determine the upper and lower limits which stops the motor from moving the arm up and down too far.
- One (1) color sensors, one to detect the color of the tape on the mat.
- One (1) external camera, used to detect the number of rings on the floor.

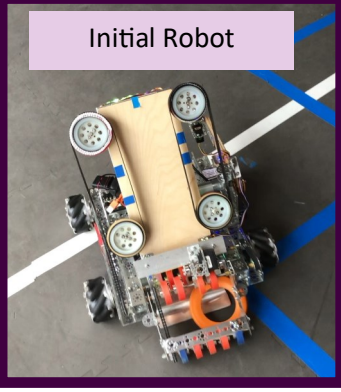
Throughout our season the robot has not had no major structure changes as it is a sound design. We did change out motors to increase the speed of the drive train and shooter. This meant we could move around the field faster to pick up the rings. The faster shooter motor meant that we could have a better chance of getting the ring in the tower. We change the wobbler arm to a shorter arm allowing for better control, which made it easier to use.

We use blinkin lights to let us know what function the robot is performing during the autonomous runs.

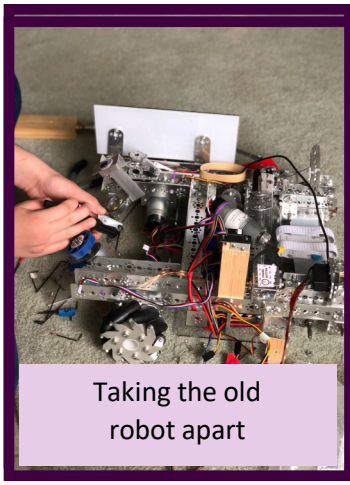

Clay camera mount


Testing shooter




Initial Robot


Initial design fits inside the sizing tool


Taking the old robot apart

Signature : Harper

Date: April 16, 2021

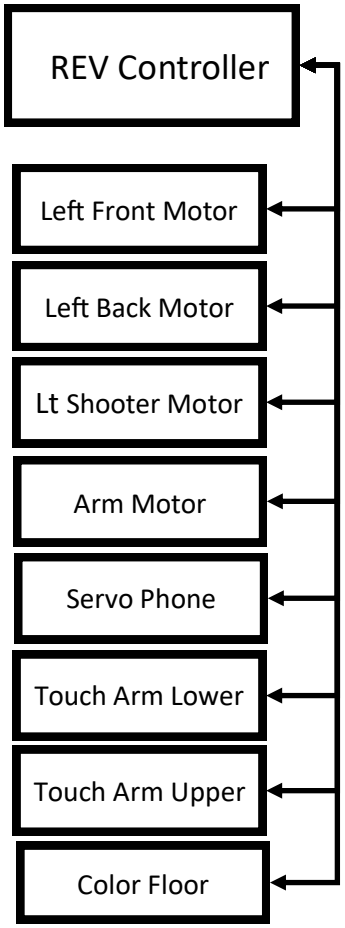
# Hardware connection and controller configuration



Driver 1 Control Function Layout


Driver 1 Control Function Definition

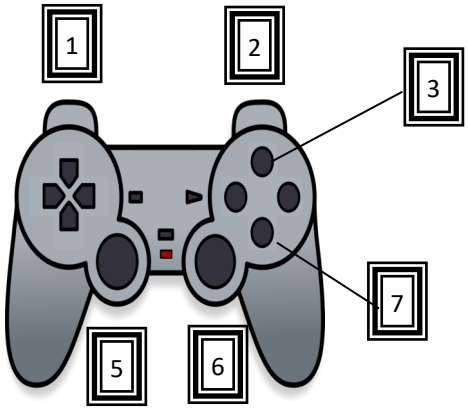
1. Turn right or left by using the Y-axis
2. Strafe right or left by using the Y-axis and move forward/ backwards using the X-axis




Before starting the robot programming we determined the functions of the controllers, as they define the functions to be programmed and performed by the robot. We use two controller so that we have more participation on the team. This provides a better teamwork environment.

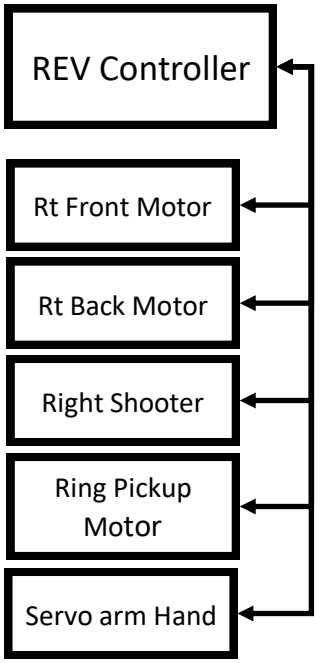
We defined the following functions: 1) Pickup rings and shoot them; 2) Pickup the wobbler and move it.

Driver 2 Control Function Layout




Driver 2 Control Function Definition

1. Shoot Ring
2. Pick up Ring
3. Close Hand
4.
5.
6. Move arm mechanism
7. Open Hand

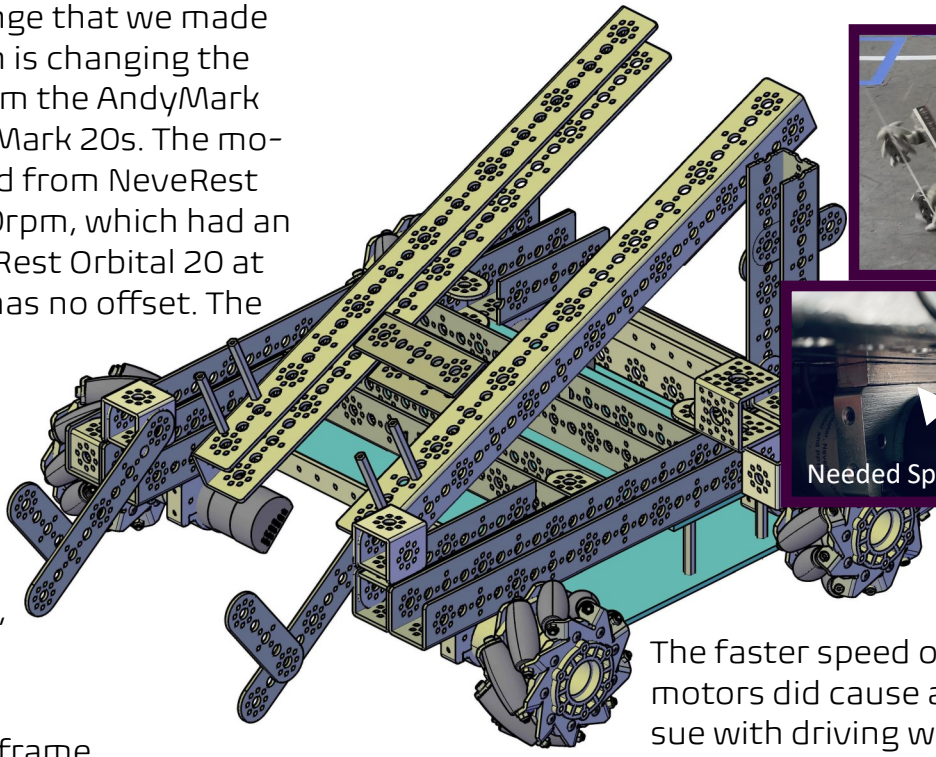


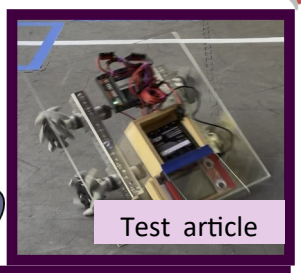

Signature : Harper

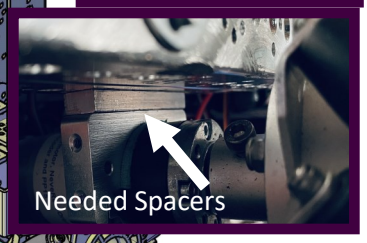
Date: April 16, 2021

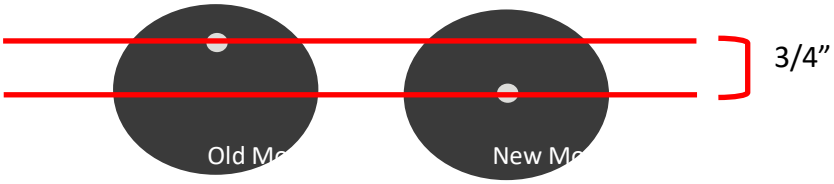
# Drive Chasis Mechanism

The biggest change that we made to our drive train is changing the drive motors from the AndyMark 40s to the AndyMark 20s. The motor style changed from NeveRest Classic 40 at 160rpm, which had an offset to a NeveRest Orbital 20 at 340rpm, which has no offset. The motor change had an issue that the robot dragged on the floor causing it to not drive properly , so we had to add a 3/4" spacer between the motor bracket and the frame.

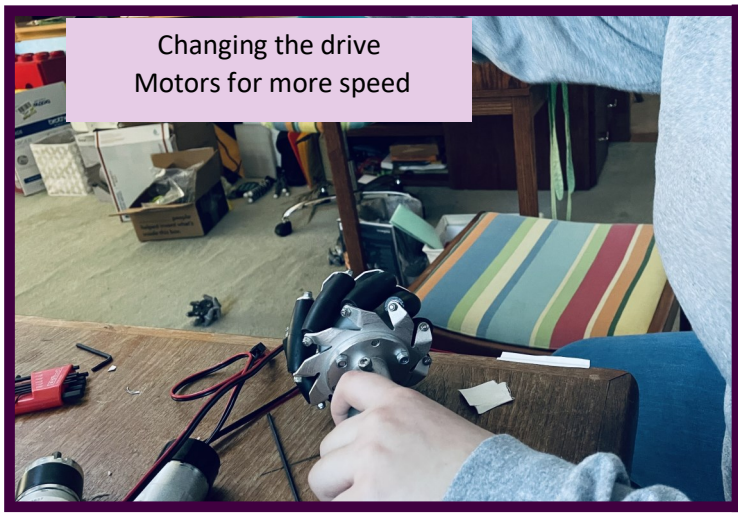


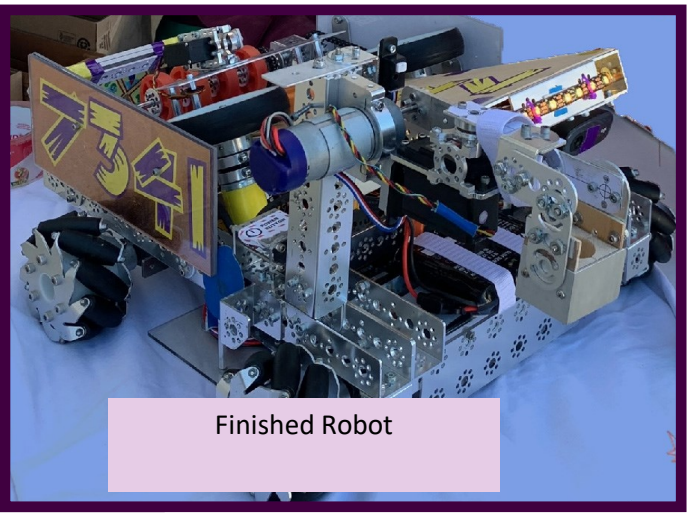



The faster speed on the new motors did cause a small issue with driving when we first changed them. The things that we loved about the new motors are that they were 1) quieter and 2) drove smoother on the mat.


Changing the drive Motors for more speed


Finished Robot

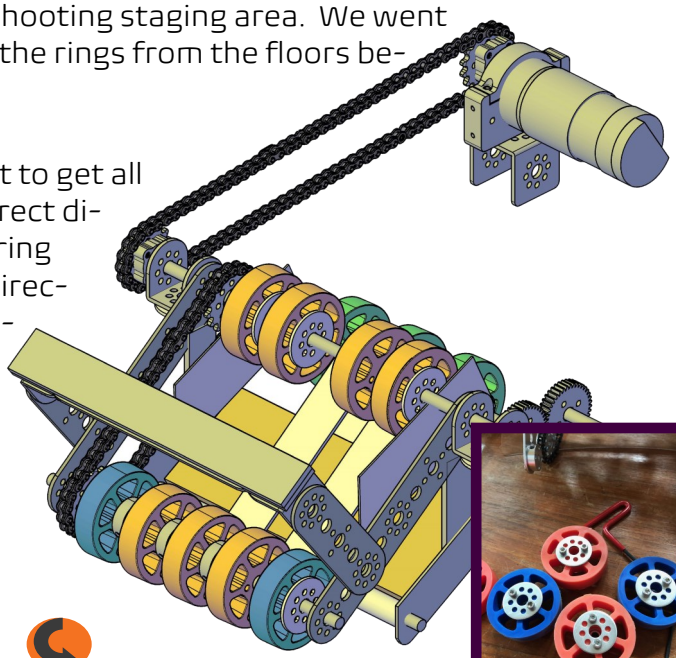
Signature : Harper

Date: April 16, 2021

# Ring Pickup Mechanism

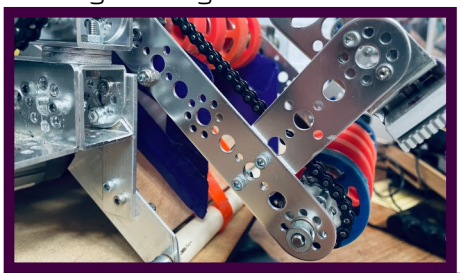
Our "Ring Pickup" has gone through several minor changes in the angle, pickup ramp, wheels, and pickup belts used in the construction of the robot. The biggest of the minor changes occurred when the "Shooter Ramp" changed from a 45° angle to a 22° angle. The angle change made our initial aluminum ramp, which was an extension off the end on the "Shooter ramp", very unusable. We changed the "Ring Pickup Ramp" to a wooden ramp and added two belts to help move the rings from the floor to the ring shooting staging area. We went through a few different belts ideas that raised the rings from the floors before finding the orange urethane flat belt.

We use a combination of chain, gears and a belt to get all the needed wheels and belts moving in the correct direction to get the rings from the floor into the ring stage area. The top wheels go in a downward direction while the bottom wheels go in a upward direction moving the rings forward.

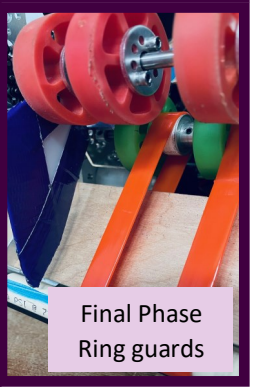


We changed out some of the pickup to the green wheels, because they are squishier allowing the rings to move easier and faster through the pickup mechanism.






Our initial belts were rubber drawer liner and gaffers tape. This work ok until the pollen season arrived and pollen was all over the mat or we opted for the new belt.

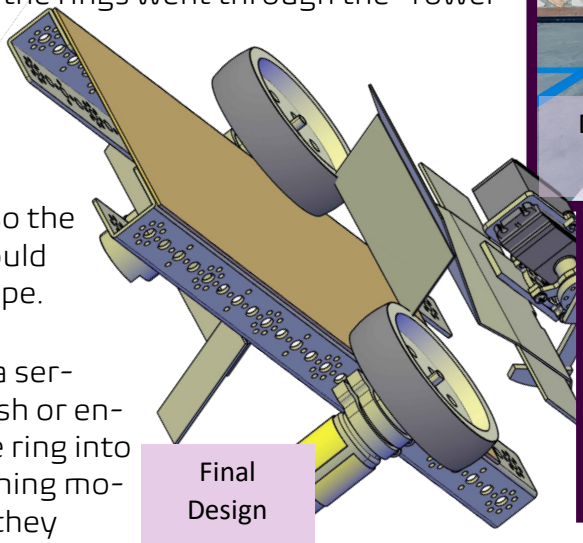

Signature : Harper

Date: April 16, 2021

# Ring Launcher Mechanism

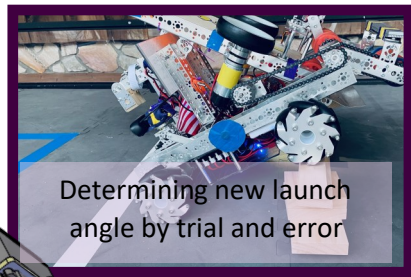
Our "Ring Launcher" has changed a little from the start, as we followed our "ball launcher" design from a few years ago when we started. We thought that we needed the belts to get the rings from the back of the robot to the front, but after the first match we decided to try shooting the rings from the back of the robot. We did find that it worked, but the motors did not have enough speed to get the rings there fast enough and our angle was at about 45° . We changed out the AndyMark motors to the Yellowjacket motors which have a speed of 6000rpm. These new motors were too fast and the rings went over the "Tower Goal" when the ramp was at 45° . We change the angle to 22° and the rings went through the "Tower Goal".

We decided to add additional zip ties so the rings would not escape.



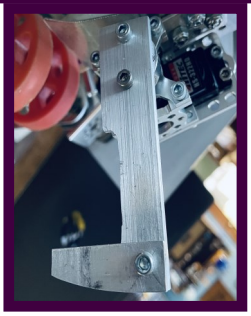
Final Design

We use a servo to push or engage the ring into the spinning motors, as they need to spin up to speed before shooting the ring to the target.



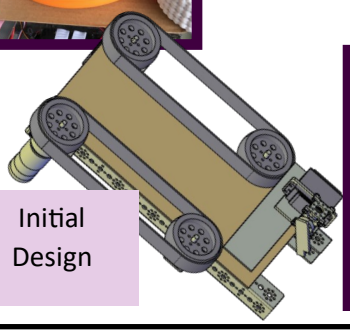
Determining new launch angle by trial and error

Ramp angle



These are the iterations of the ring pushers. The purpose is to push the ring so that it engages into the launch wheels. The final design is so that we can load two rings into the launch area and shoot them one at a time. The bottom will be launch by pushing it first, the second ring falls into place to be deployed second.

Changed out the motors



Initial Design

Ready for launch

Signature : Cailyn

Date: April 16, 2021

# Wobbler Mechanism

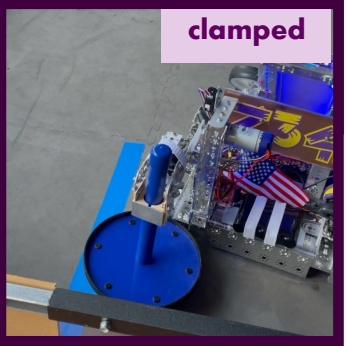
Our "Wobbler Pickup" mechanism first started out with the clamp (hand) that we had to pickup the little statue from a few years ago. While it did hold the wobbler, there was not have enough surface area to hold the wobbler steady while moving and lifting it. Mr. Louis helped us in the construction of our current clamp (hand). We added an aluminum plate to the front edge of the right or moving side to assist in the capturing the wobbler during end game and moving the second wobbler during the match so that we can move both wobblers over the wall during the end game.


Old clamp

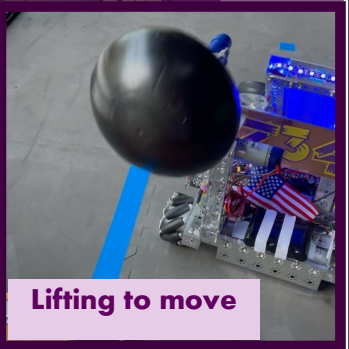

clamping


First Iteration

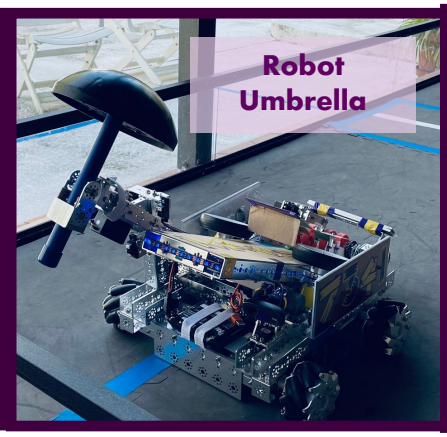



clamped


Over the wall


Lifting to move


New clamp


Robot Umbrella


Going over the wall

Signature : Cailyn

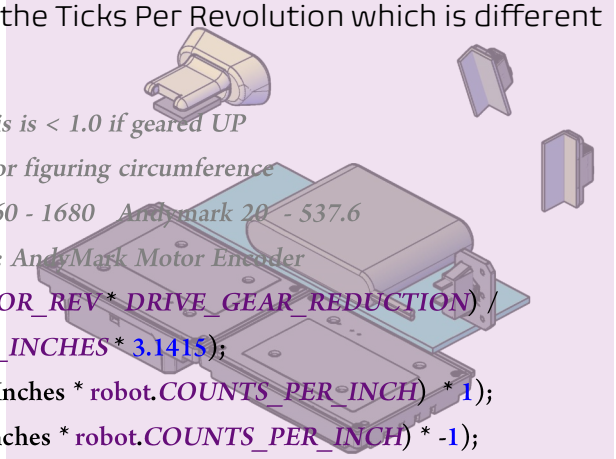
Date: April 16, 2021

# Software/Control

We have two main operational programs which run on the Rev Control Hub: one for Teleop portion of the match and one for the Autonomous or the start of each match. The Autonomous program starts with a series of question that allows us to setup which side of the field we are on (red/blue) and which position (1 or 2) to jump the appropriate part of the code. The Autonomous program is setup to use the camera to detect the number of rings on the field (0, 1 or 4) indicating which target to place the wobbler (A, B, or C). We use several subfunctions during the autonomous to drive the robot, move the robot arm/hand and shoot the rings. These subfunction allow for quick programming and reuse of code. Following is the Drive subfunction example:

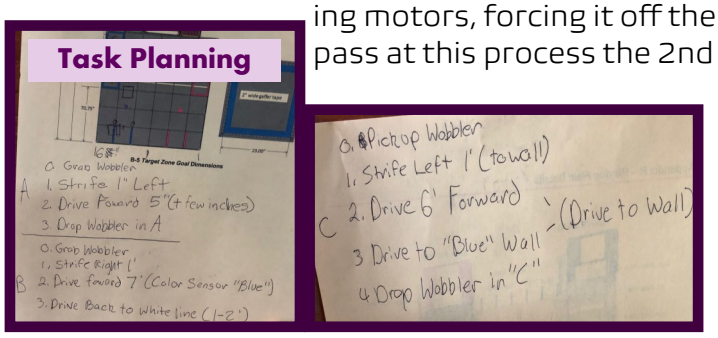
```
drive.encoder2Drive((speed).5,(forward/backwards) 0,(right/left)0 0,(sright/sleft) 1, (Inches to travel)21, (execution timeout)5);
```

We do have a special algorithm that determines the number of motor rotations for the distance we need to travel. The distance calculation is based on the Ticks Per Revolution which is different for the different motors types.



```
static final double     DRIVE_GEAR_REDUCTION    = 1;        // This is < 1.0 if geared UP
static final double     WHEEL_DIAMETER_INCHES   = 4.0 ;     // For figuring circumference
      // Andymark 3.7 - 103.6   Andymark  40 - 1120   Andymaark 60 - 1680   Andymark 20  - 537.6
static final double  COUNTS_PER_MOTOR_REV    = 537.6 ;    // eg: AndyMark Motor Encoder
static final double  COUNTS_PER_INCH    = (COUNTS_PER_MOTOR_REV * DRIVE_GEAR_REDUCTION) /
                                          (WHEEL_DIAMETER_INCHES * 3.1415);
newLeftTarget =       robot.left_front.getCurrentPosition() +  ((int) (Inches * robot.COUNTS_PER_INCH) * 1);
newleft_backTarget = robot.left_back.getCurrentPosition() +  ((int) (Inches * robot.COUNTS_PER_INCH) * -1);
newRightTarget =      robot.right_front.getCurrentPosition() +  ((int) (Inches * robot.COUNTS_PER_INCH) * 1);
newright_backTarget = robot.right_back.getCurrentPosition() + ((int) (Inches * robot.COUNTS_PER_INCH) * -1);
```

One control function we added to our software is a one touch ring launcher. You depress the "Ring Shooter" trigger and the following tasks are completed: 1) The ring pickup motors are started to move the ring forward a little; 2) The shooter motors are powered up; 3) The servo pushes the bottom ring into the moving motors, forcing it off the robot; 4) There is a short delay moving the pusher back allowing the top ring to fall into place; 5) The servo pushed the ring into the moving motors, forcing it off the robot; 6) All the motors are stopped. The first pass at this process the 2nd driver had to remember to start the ring pickup motors to insure the rings are up high enough in the mechanism, start the shooter motors, then push the button so rings where pushed into the shooter mechanism.



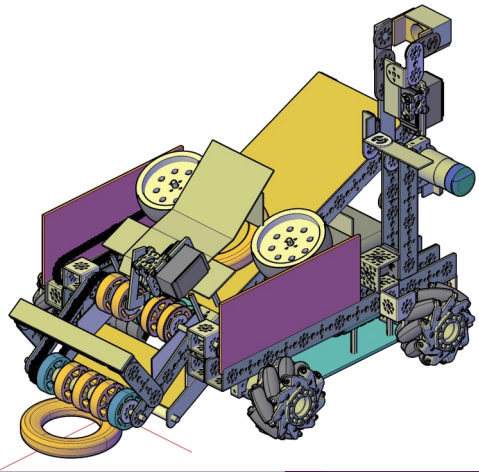


Signature : Cailyn _____ Date: April 16, 2021

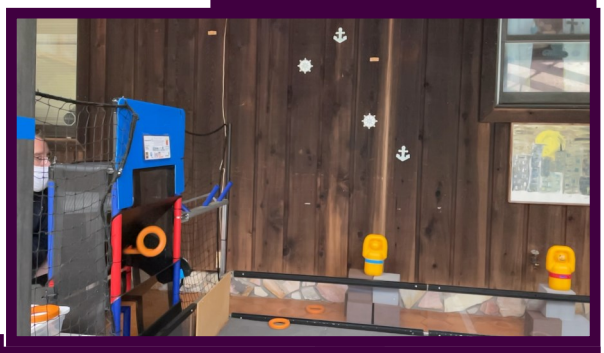
# In Summary

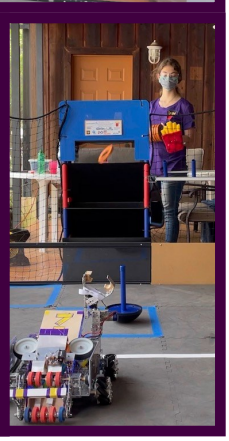
Initially, we had a robot design that consisted of 4 mechanisms working together to move the wobbler to the correct drop zones, shoot as many rings into the goals as possible and bring the wobblers back over the wall. At first our claw couldn't pick up the wobbler, the robot moved too slow, the rings kept going off the sides of the pickup system and the belt used to shoot the rings would fly off. After lots of trial and error and adjustments to the robot's systems and code, we have landed on a design that solved all of those problems. We still have some problems, such as the wobbler slipping out of the robot's claw when we lift it too soon, but overall, Princess Charlie is much more efficient than when we began.

We switched our motors for the drive control, and the ring shooter with motors what were much faster to increase the speed for better performance. We stopped using belts to shoot the rings and added orange urethane belts to help with the ring pick up. Side guards were added near the shooter to make sure the rings don't fall out of the robot. These changes seemed to be relatively some, but made a big impact on the robot's over all performance.

We have one closing note, which is Thank you for this year's season and we are looking forward to next year!!





Signature : Cailyn

Date: April 16, 2021