

ENGINEERING NOTEBOOK



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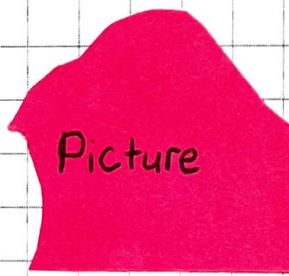
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Example pageTitle

- Bullet points that show main idea, and how we look to tackle this new game. (At top)
 - Bullets to show in depth how we will build our robot.
 - Any mistakes will be crossed out, with the correct word following ~~right~~ right after.
 - Sketches and pictures will be a visual for our intentions, with it being next to the idea. There will also be labels to show different parts of the robot.
- Ex: Idea → Sketch The letter C.
- For pictures, there will be a picture with a brief description.


Picture

There will be a description, showing how and why we did this.

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PROPRIETARY INFORMATION

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Our
Team!

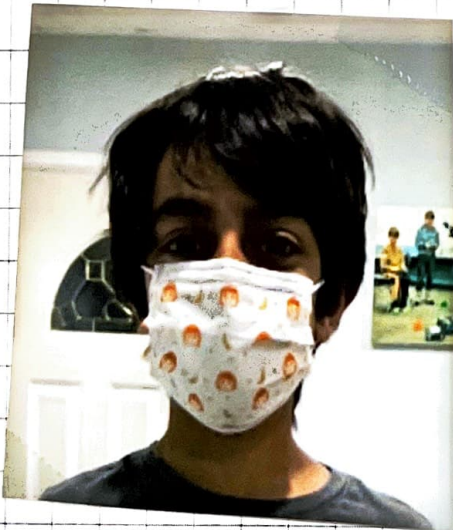


Gavin McKean

6th Grade

Steven Tu

8th Grade



Jaxon Uribe

4th Grade



Ceara Mac'krite

8th Grade

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TITLE Team Organization PROJECT

Continued from Page

Every team member will be given a job according to there strengths. This page will show everyones roles, while also explaining how we will work together

PLAN

We will base everyone's roles on there strengths, while also trying to get everyone to learn something ~~we~~ new. For example, I, Steven, hope to improve my coding. Thus, I will be exposed more to programing. Taxon just started VEX, so he will slowly be shown to all of building, programing, and driving.

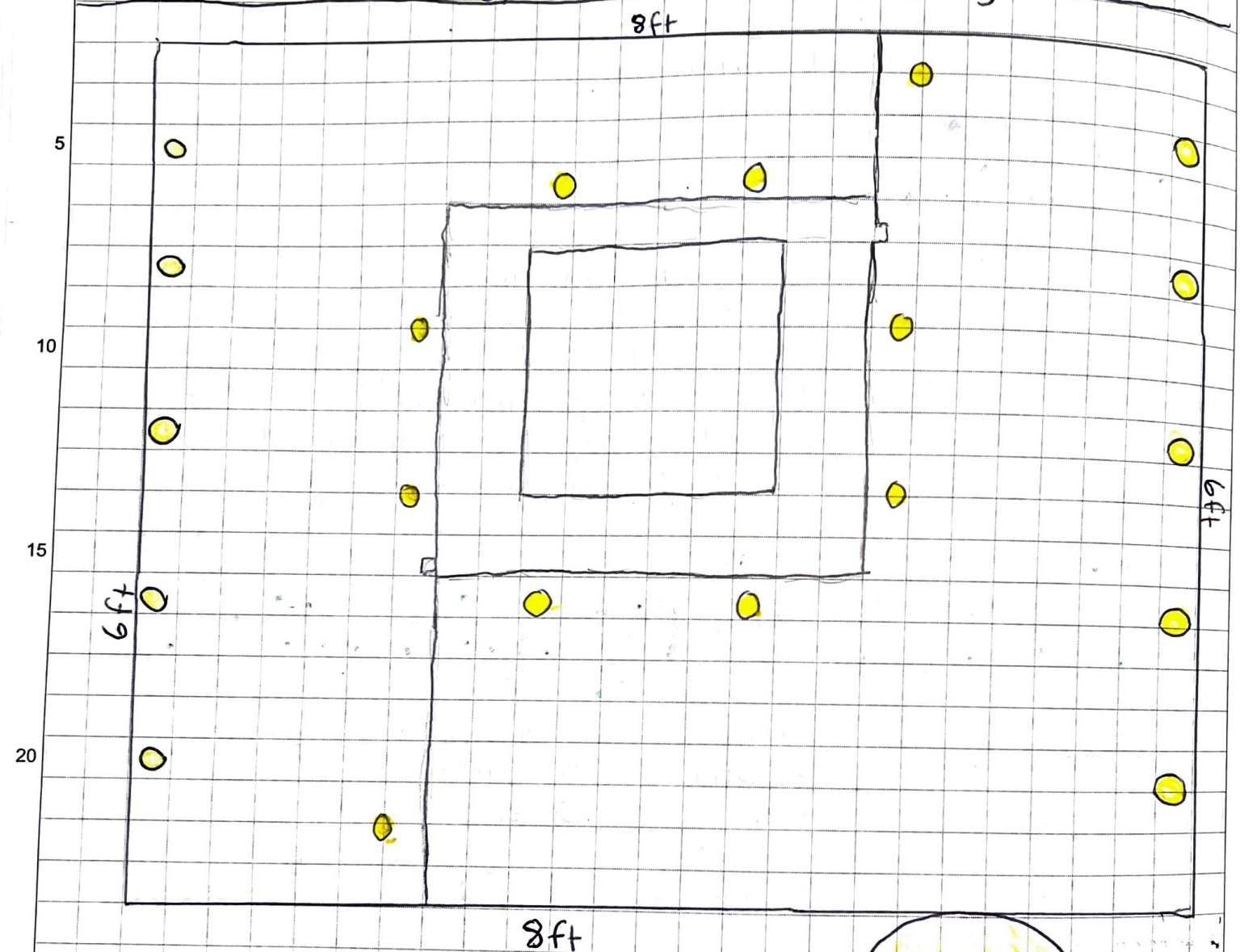
Team Organization

<u>Steven</u>	<u>Gravin</u>	<u>Leara</u>	<u>Taxon</u>
• Captin	• Co-Captin	• Main Builder	• Driver
• Main Driver	• Driver	• Driver	• Designer in-training
• Co-builder	• Co-builder	• Co-programmer	• programmer in-training
• Co-programmer	• Co-programmer		
• update notebook			
•			

• These roles are based on our skill set, while also being exposed to parts we need improvement in.

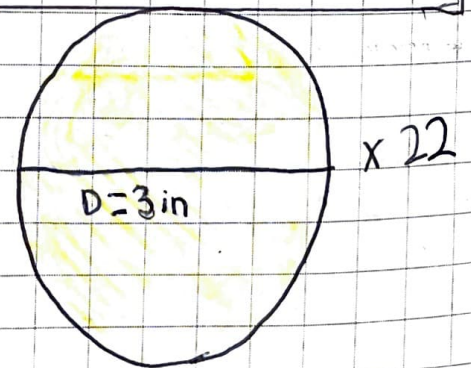
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• SCORING OBJECTS

- 22 Yellow Balls Total
- High Hanging Zone
- Low Hang Zone
- Cleared Corral



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PROPRIETARY INFORMATION

TITLE Game Breakdown PROJECT

Continued from Page 4 Pitching In is played on a 8 by 6 ft field, with 60 seconds in the match.

Each Cleared Starting Corral	5 Points
Each Ball in the Low Goal	2 Points
Each Ball in the High Goal	6 Points
Each Robot Low Hanging	6 Points
Each Robot High Hanging	10 Points

Objective

Pitching In is played by shooting balls into the high goal. Clearing Starting Corrals and Hanging are also vital aspects.

Breakdown

There are 22 balls in total, which can be scored in the low goal or high goal. The balls must be out of the starting position to be considered a cleared corral.

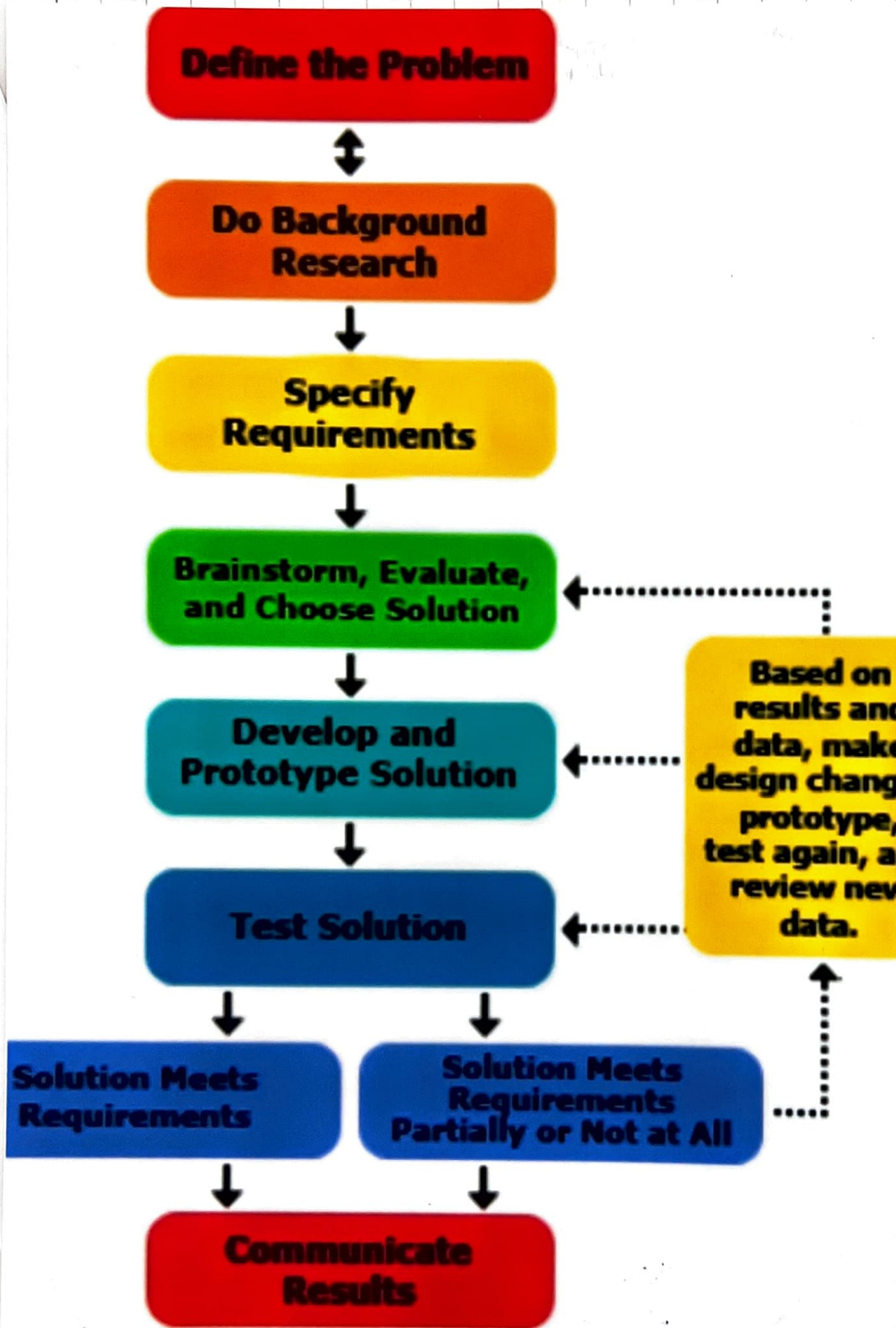
The low hanging bar is 7.5 inches and the high hanging bar is 15.5 inches. For the high hang, a VEX part that is 15 holes long must fit under.

starting zone

There are 8 different starting zones, with 4 on each side.

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This is our design process this year.

Throughout this year, we will experience various problems.

First, we will see the problem, gathering research to see how we can find a solution.

Next, we will brainstorm all of our thoughts, while also choosing the best solution.

After, we plan to develop and make the solution and finding the test results. If it doesn't work, we will make changes to work better.

If it works, we will see the results and hopefully improve it.

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PROPRIETARY INFORMATION

TITLE Design Brief

PROJECT

Continued from Page

This page outlines an overview of the game, a problem and design statement, along with some constraints.

Game Overview

The objective of the game is to score the 22 balls into the low or high goal. Alliances will also be granted extra points clearing the corral and hanging

Problem Statement

There are 22 balls that must be scored in 2 different scoring zones. Robots must be able to pick up balls, and shoot balls. Robots can also hang on the low or high bar.

Design Statement

Think, design, and compete with a robot that can score balls in the high goal and hang.

Constraints

Every robot has to fit in a 11' by 19' box, and must start under 15 inches. To go under the low bar, the robot must be shorter than 7.5 inches.

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TITLE Brainstorming

PROJECT

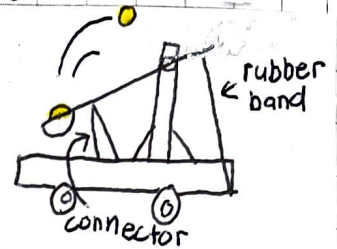
Continued from Page

These are our teams initial thoughts for
how we can tackle this years game

Catapult

The catapult was our first
thought for how we can get balls in
the high goal. (via fling)

side view



This catapult design
will allow the balls to go
in the high goal. The rubber
band gives it tension so the
balls can go farther.

Pros

- can hang
- powerful

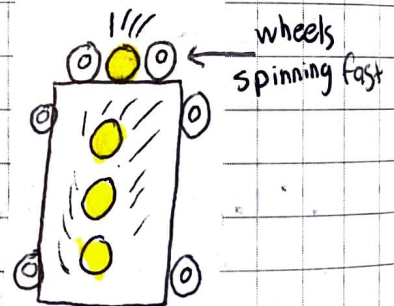
Cons

- takes time to shoot
- only 1 at a time
- big size

Flywheel

The flywheel also came to
mind. By spinning 2 wheels very fast,
the balls can shoot very far.

top view



Pros

- Accurate
- Consistent
- easy to make

Cons

- takes time to shoot
- only 1 at a time
- must feed correctly
- angle must be perfect

By having a very fast gear
ratio, the balls can go far
enough into the basket. If we
can have the perfect angle,
this flywheel can work very
wheel.

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8/28/21

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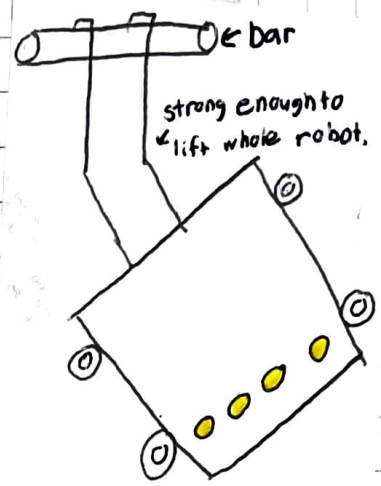
TITLE Brainstorming 2

PROJECT

Continued from Page 8

Hang Robot

This hang robot can put multiple balls in the high goal, while also getting 10 additional points from hang.



Pros Cons

- Can take many balls in high goal
- base must be light
- base is long
- be high hang
- consistent

The goal of this robot is to put balls over when we hang. There must be a strong gear ratio to lift the whole robot up.

Inspiration from YT: 94666

Push Robot

This push robot will effectively be able to push balls in the low goal.



Pros Cons

- very fast
- cannot put balls in the low goal
- can hang in high goal
- pick up high floor, low ceiling.
- a lot of balls

This robot will have a ball holder to put balls in the low goal. The speed of the robot will allow it to pick up many balls.

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TITLE Grading Initial Thoughts. PROJECT

Continued from Page

We have graded our 4 ideas, and we will see which idea we should do.

(Graded from 1-10)

		Catapult	Flywheel	Hang Robot	Push Robot
5	Can this robot score in the High Goal?	7	10	8	0
10	Can this robot score in the Low Goal?	5	8	7	10
	Can This Robot Hang?	5	0	10	5
15	Is This Robot Easy To Drive?	4	5	9	9
	Which Robot Can Get The Most Overall Points?	5	8	9	5
20	Total	26	31	43	29

we have concluded that the hang robot is best, but ~~we~~ are still interested in the flywheel. We are happy that we have options, and we will see which one we do.

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9/1/21

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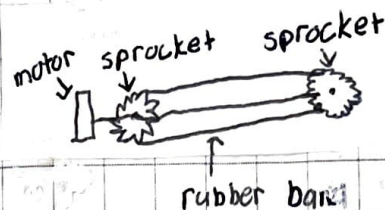
TITLE Intake and Hang ideas. PROJECT

Continued from Page

The intake is very important to put balls in the robot. The hang will also give us additional points.

Intake

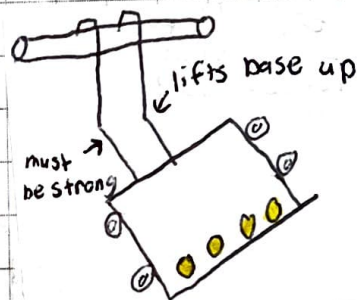
The easiest way is to connect two sprockets, and then put rubber bands around it.



This intake is simple and should be able to put balls in the robot.

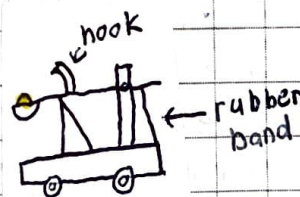
Hang

For the high hang, we will have the robot go over the ground, and put balls in the high goal.



We are thinking the gear ratio will be big to small.

For the low hang, we can have a hook on our catapult/push robot. The hook must be strong enough to hang the whole robot.



That hook will allow us to hang on the bar.

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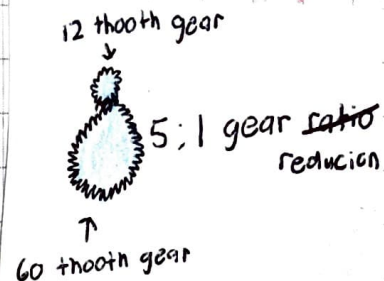
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TITLE Starting the Flywheel PROJECT

Continued from Page

Because we still have a lot of time before the competition, we have decided to explore our options, starting with the flywheel.

We have decided to have Gavin make the flywheel. We are also testing to see if a big to small gear ratio is enough. We know that if we can make the flywheel consistent, it can shoot over 6 balls in the high goal.



Results

We have concluded that the 5:1 Gear Ratio is not fast enough, because of its lack of power. It isn't fast enough to shoot the balls in the basket, and is only going about 60% there.

Redesigning

Because our flywheel doesn't shoot the balls far enough, we have decided to make a compound gear ratio. We will build from our 5:1 Gear ratio, while also adding on more gears to increase the speed.

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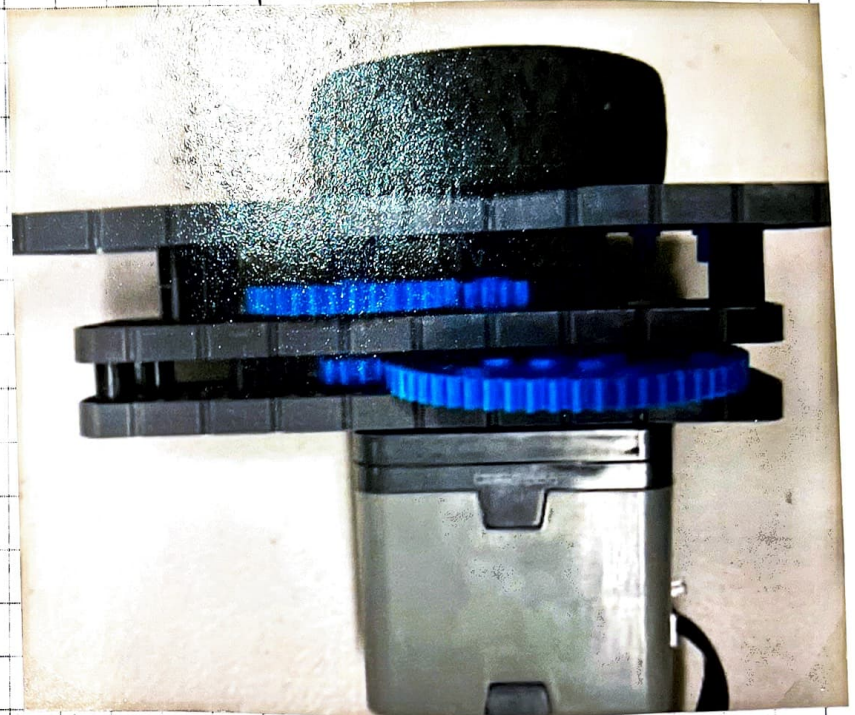
TITLE Improving the Flywheel PROJECT

Continued from Page

We are making the flywheel faster by adding a gear ratio, hoping the balls will go in the basket
top view

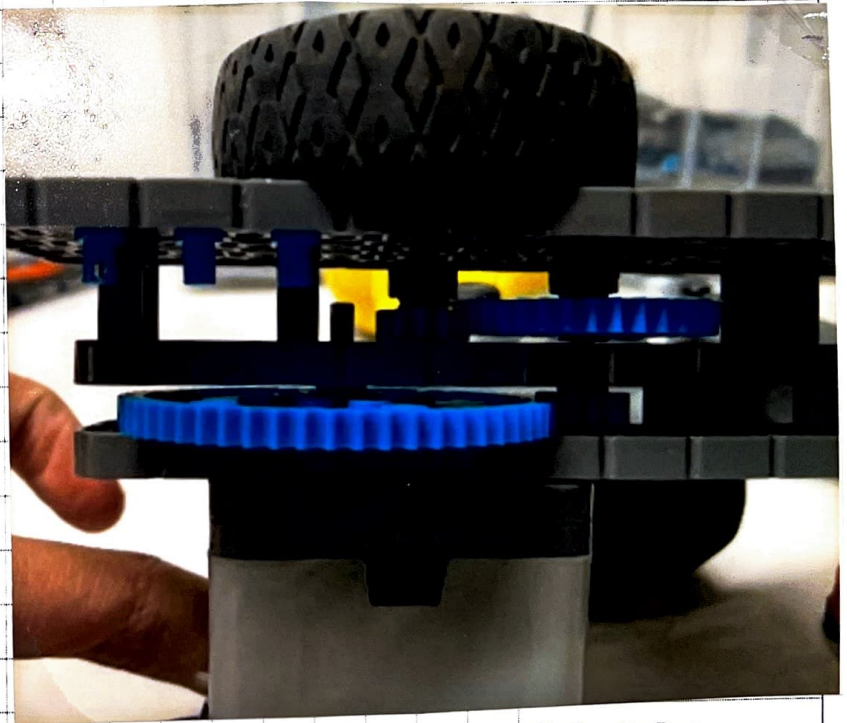
We have decided to do a gear ratio with a big to small, which is connected to a medium gear. The medium gear then connects to a small gear. This is a 15:1 gear reduction.

Top View →



After tests, this is a good amount of speed and should be able to shoot it in the basket.

Side View →



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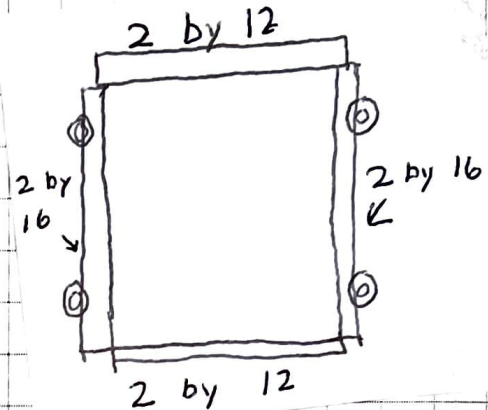
TITLE Building Base and Intake PROJECT

Continued from Page

After making a flywheel that hopefully works, we need to build the base, intake and cage.

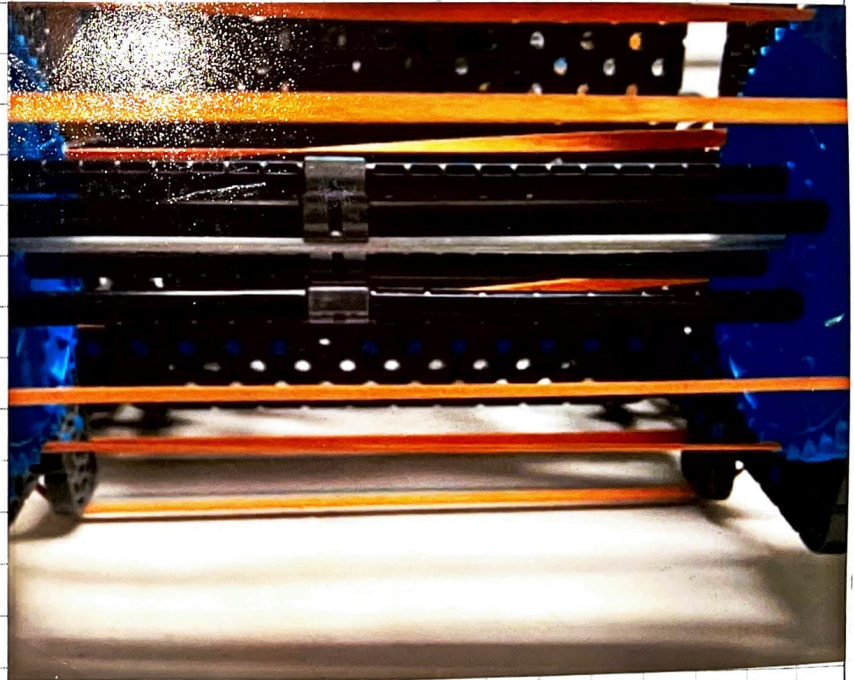
Base:

The base will be about a 16 piece VEX piece, and for now about a 2 by 12 piece wide. It will be a standard gear ratio with medium gears.



Intake

The intake must be efficient to get the balls in the flywheel. We will be connecting 2 big sprockets, while also surrounding them with rubber bands. We are also thinking of putting the intake on a pivot point so it can adjust it when the balls come in.



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PROPRIETARY INFORMATION

TITLE Making cage + tests

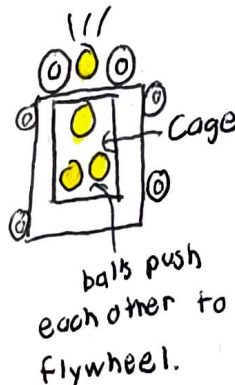
PROJECT

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The cage is the next thing that must be built. We also need to improve our intake. First we need to see if our cage fits our flywheel, while shooting correctly.

Cage

- Because we are already using several motors, we plan on making a passive intake. It will have the balls push each other in the flywheel.



The cage is built by stringing 5 2 by 16s together. It will be big enough to hold at least 2 balls at once.

Tests

- Out of all the balls, the flywheel made 9 balls in the basket, and every ball went in the low goal.
- The intake still needs work. to see if the balls can go in the cage.
- We have everything, but we need to put it all together on the robot.

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Steven T4

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Even though the flywheel works, the intake and cage isn't going to well. Also, the flywheel being so heavy may prevent us from hanging.

Intake

- The intake is breaking a lot, and the connection point to the robot is very weak.

- We also found out that the intake will not push the balls in as we expected. The cage needs 3 balls to shoot, but the intake can only put 2 balls in the cage.

Cage

- Although it is helpful that the ~~intake~~^{cage} doesn't use a motor, it is also hurting us. The balls aren't being pushed into the cage. If we attempt to shorten the cage, then it wouldn't fit in the flywheel base, while also hurting the angle.

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After realizing the problems of the flywheel, we are thinking of heading to a new direction. This page outlines our thoughts

Current Flywheel

Pros

- flywheel looks good
- found angle for flywheel

Cons

- cage is bad
- intake doesn't work
- can't hang

We have decided as a team that the flywheel is quite flawed, and requires a lot of changes if we keep on using the robot.

The Conversation

Gravin suggested the idea of going to the hang robot. He states that it is way more simple than the flywheel.

I also added that we will always have the flywheel and if the hang robot doesn't work, then we can work on the flywheel.

Our whole team liked the idea of the hang robot over the flywheel.

In The Future

We have concluded that Gravin and Ceara will work on the hang, while I, Steven, and Jaxon will improve the flywheel.

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Steven Ty

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4/30/21

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TITLE Starting the Hang Robot PROJECT

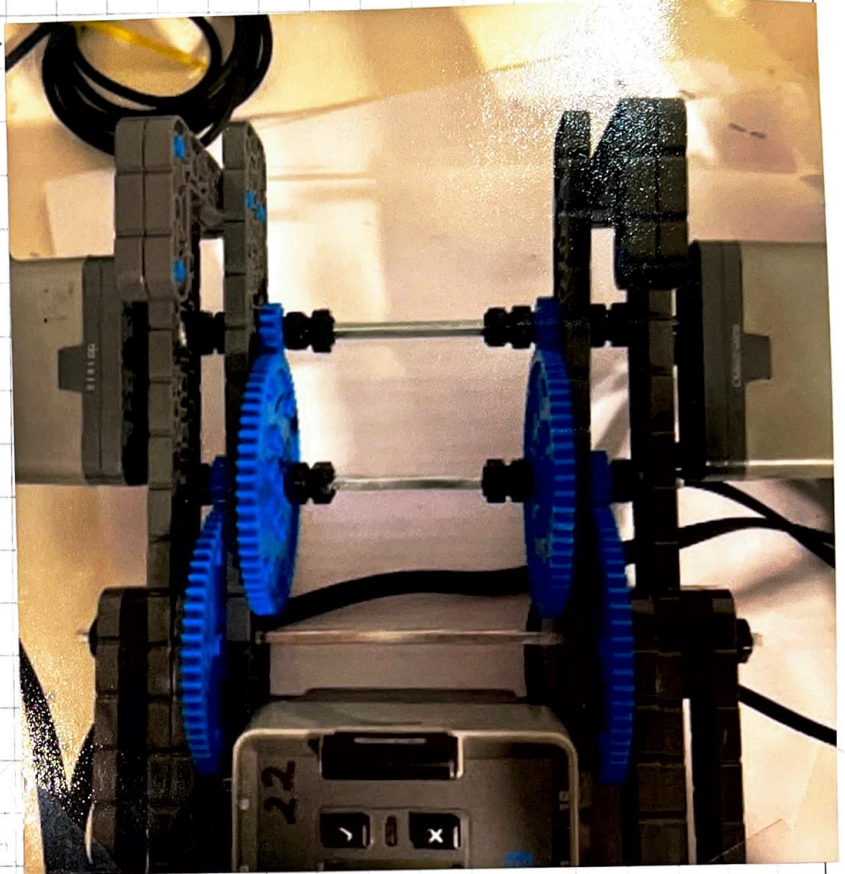
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Gravin is starting the hang robot mechanism,

This page outlines how we made the mechanism

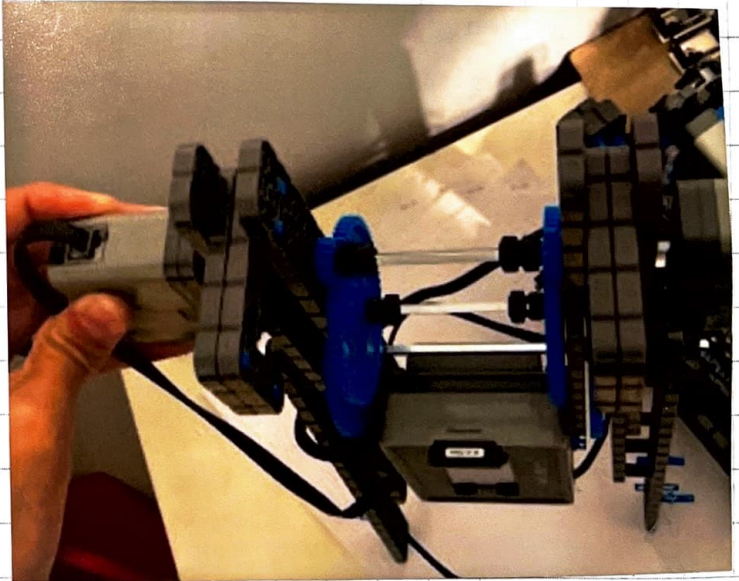
Because this hang robot must be strong enough to lift the whole base, we are making the gear ratio extra strong. Right now, we have a small gear to a big gear, which is then connected to the small gear. That final gear connects to a big gear, making a 25:1 Gear Reduction

Front View →



There are 2 motors for extra strength. There are hooks at the top to hang on the bar. The brain is placed under the gears.

Top View →



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10/1/21

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PROPRIETARY INFORMATION

TITLE Building the base.

PROJECT

Continued from Page

The Hang Robot mechanism looks good, but of course the base is very important. The base must be light for the hang to lift it

Base

The base must....

- be very light.
- long enough to put balls in.
- move at a decent speed.

For now, we will have a 1 to 1 Gear Ratio, connecting 5 medium gears next to each other. There will be a normal wheel in front and omni wheels in the back.



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TITLE Designing the Intake

PROJECT

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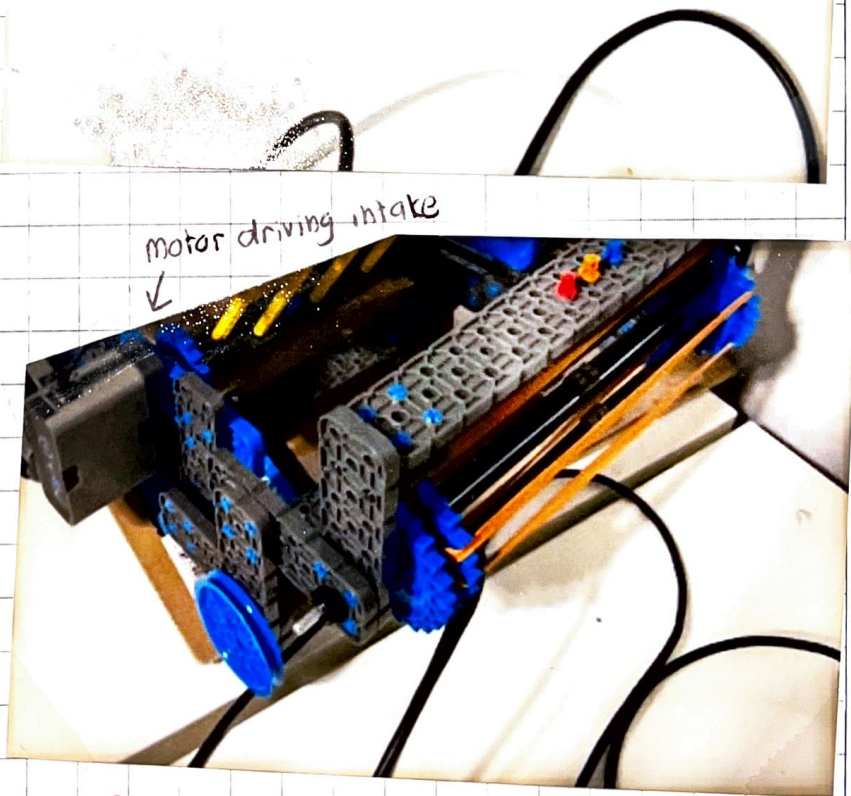
The intake should be simple, but effective to put balls in the robot

The intake will be 2 medium sprockets connected by stand offs. The intake will be very wide so the balls can be collected easily. It will be as long as a 2 by 16 VEX piece.

Front View

Because the intake must be ^{long} ~~very~~, there isn't enough space to just attach a motor. So, we are connecting 2 more sprockets through chain. This will give just enough room for the motor, while performing to same.

Support pieces will not only keep the robot together, but also keep the balls in the robot.



Side View

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10/8/21

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TITLE Changing the base.

PROJECT

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We have changed the base to better fit this hang robot. It will be as long as before, but use less space and more light

Instead of doing a 5 gear drive, we will be doing a 3 gear drive. However, there will be a medium gear on top of the middle gear. This will place the motor higher.

Because our base is so long, the wheels can't extend through the robot. So, we are adding a sprocket like piece at the end of our robot. This will keep the robot very stable.



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Steven Ty

DATE

10/10/21

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TITLE Attaching the Hang

PROJECT

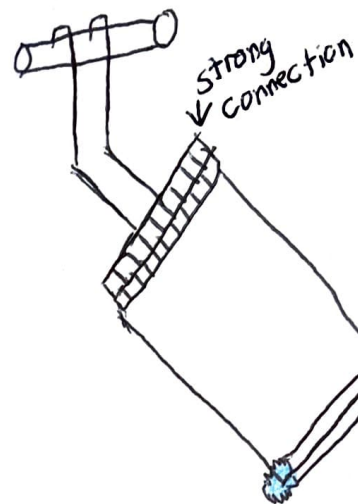
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Currently, the base, drive and intake is looking good.

Now, we must connect the Hang mechanism and cage.

side view

Now that we have our base and intake, the next step is connecting the hang. This connection must be the strongest point of the robot, as it is lifting the whole base up. We have some 2 by 16 vev pieces connected with several corner pieces. This is very sturdy and hopefully can lift robot up.



Tests

we have learned several things about our tests.

- First, the mechanism cannot go fully straight. This is making the angle off, not allowing us to hang on the bar. The gears are very high and there are some connection standoffs in the way.
- Also, our connection from the hang and base is ripping off. We will attempt to fortify it with our empty space.
- Base might not be long enough to put balls in. We will see when we build the cage.

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10/14/21

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PROPRIETARY INFORMATION

TITLE Attaching the Hang 2 PROJECT

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There are some problems with the hang. It cannot go fully straight, making a bad angle to hang. We will think of some solutions to fix this problem.

Hang

Right now, the gears and some standoffs are in the way of the hang going vertical.

Solutions

We know the importance of the hang going vertical, as it makes hanging on the bar much easier.

Ceara offered to lower the gears so there will be more space for the hang mechanism to move.

Taxen said to remove the standoffs so the hang can smoothly go forward and back backwards.

My idea is to make the bars that are in the middle and push in the bar should be shortened. It is currently 2 by 16, and by making it shorter, the mechanism should be able to go forward and back easily.

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10/15/21

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Continued from Page

Although we have discovered some problems with connecting the hang, we have some solutions and we will test them

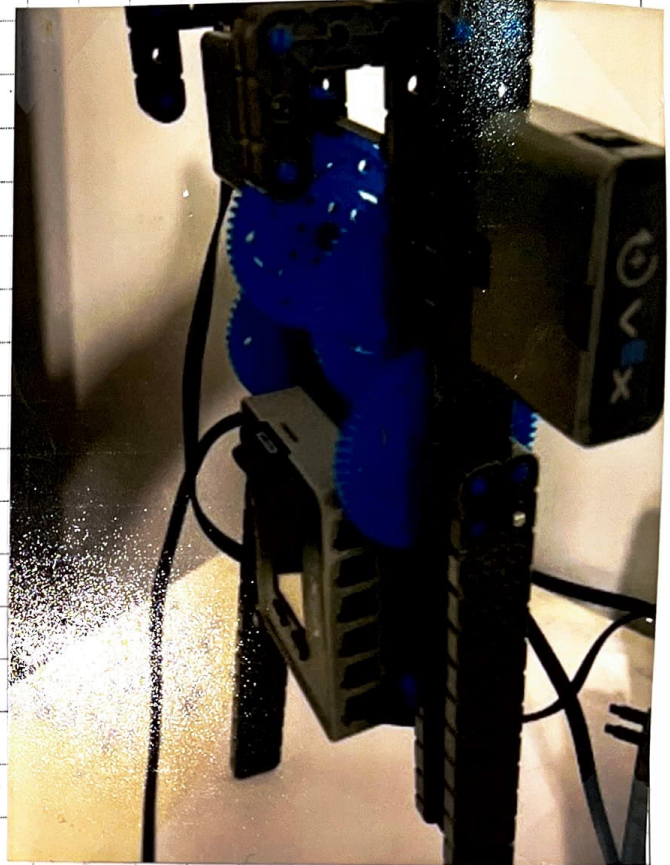
Tests

First, we lowered the gears. It helped a bit, but the hang still can't go straight, we then removed some of the standoffs, but now there is no connection in the bar.

Finally, we switched out the middle pieces, making them shorter. We removed all of the over engineering connection.

Instead, I connected some double pins to a 2 by 10.

This is much simpler, but because there are over 16 double pins connecting the hang to the base, it is very strong. We ran out of time to connect it fully, but it looks promising.



↑ Side View ↑

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TITLE Testing the hang 2.

PROJECT

Continued from Page 24

Now that the connection of the hang looks better,
we need to do some final tests, and make the cage

Results

It seems like making the middle bars shorter did the trick.
The hang can now go fully straight and forward and back easily.
The connection of the hang and base is very strong.

Adjustments

There still has to be some adjustments with the robot.
The placements of the hooks can vary, depending on how
tall it must be to easily hook on. The hooks are a bit
to low, so making the connection higher should do it.

For The Future

Finding the connection of the hang mechanism was very important,
and we have to build around it. The cage and practice is
all we need left to have a competent robot

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The cage is the final piece to make the robot. It will be critical to roll the balls in the basket.

Cage

When we hang, the balls will roll on the cage and into the basket. It must also be on a angle so the balls will roll.

To make this, we will get an angled piece on each side. We then have a 2 by 16 connecting them together. On that 2 by 16, there will be 6 very long standoffs. Finally, there will be a 1 by 16 connecting the standoffs in the top.



This fits nicely ~~on~~ with the intake. The angle is perfect so the balls can easily go in the high goal.

↑ Side View ↑

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TITLE Putting the Hang all together PROJECT

Continued from Page

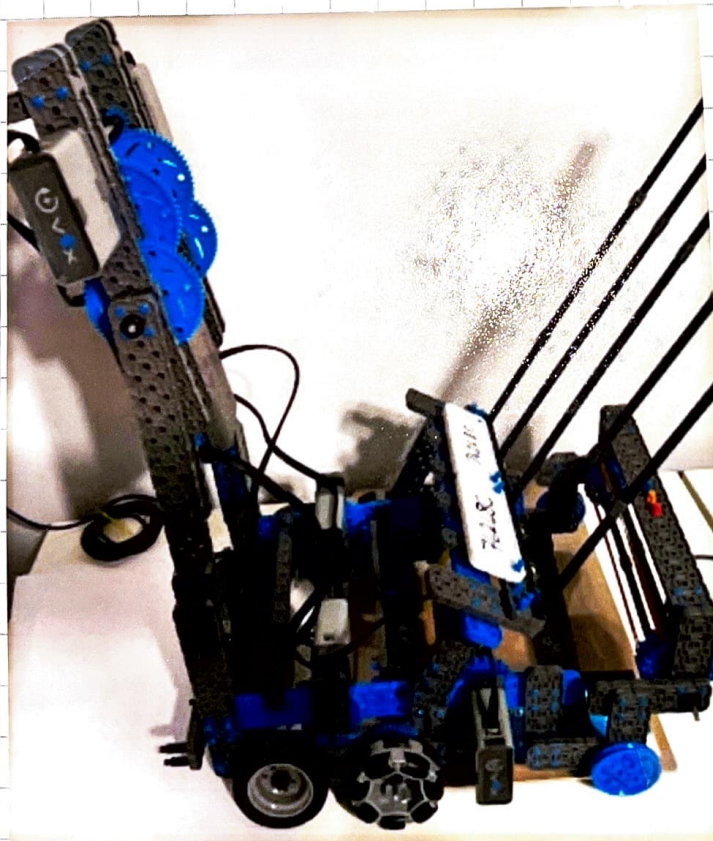
Now that we have finished the hang mechanism, base, intake and cage, we must see if it works together

In about 3 weeks and 7 sessions, our team has made a hang robot that looks promising. We had a lot of success and failure, but in the end, we made a good robot, Gavin, Ceara, Jaxen and I all contributed, and hopefully it will do good in the competition

Side View



Top View



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TITLE Coding the Hang Robot PROJECT

Continued from Page

Now that we have the robot built, we must
code the hang, intake and drive.

```

1 repeat (forever) {
2   tankControl ( ChD ▾, ChA ▾, 10 );
3   armControl ( Intake ▾, BtnLUp ▾, BtnLDown ▾, 75 );
4   armControl ( LeftHang ▾, BtnRUp ▾, BtnRDown ▾, 100 );
5   armControl ( RightHang ▾, BtnRUp ▾, BtnRDown ▾, 75 );
6 }

```

This is our code for the hang.

• Line 2 is our drive for our robot. The joysticks on the robot control the wheels. Tank control is an easy and effective way for the drive.

• Line 3 is the code for our intake. When we press the L button, the motor connected to the motor will spin. The speed is at 75, so it can pick up the balls at a good speed.

• Line 4 and 5 make the hang work. Because the hang needs 2 motors, we must code the motors to spin at the same time. By pressing the R up button, we will hang and put the balls in. When pressing the R down button, we will go down from the hang and hit the ground.

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TITLE Practicing Hang Robot PROJECT

Continued from Page

All that's left is practicing the hang robot. Because everyone is a driver, all team ~~number~~ members must be good at driving.

Practice

This robot actually isn't that hard to drive. The drive isn't that fast, so it is easy to control. The intake is more effective than expected, as it can easily put balls in the cage.

Individual Performance

- I feel very comfortable with the robot right now. More practice would be very helpful, but I'm getting the hang of it.
- Gravin is also getting used to this robot. He is thinking of some strategies to find the easiest and most effective way to score points.
- Jaxen still needs practice, but this is his first year doing VEX. Thus, it will take some time to getting used to the robot.
- Ceara is slowly getting better at the robot, but practice is necessary no doubt.
- Overall, this hang robot is good and with practice, it can be very consistent.

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Continued from Page

Although we are moving to the direction of the hang robot, we still have the flywheel just in case. Therefore, we must program it

```
1 repeat (forever) {  
2   tankControl ( ChD ▾, ChA ▾, 10 );  
3   armControl ( Intake ▾, BtnLUp ▾, BtnLDown ▾, 75 );  
4   armControl ( motor6 ▾, BtnRUp ▾, BtnRDown ▾, 100 );  
5   armControl ( motor1 ▾, BtnRUp ▾, BtnRDown ▾, 100 );  
6 }
```

- This is how we will code the flywheel.

- The tank control allows the robot to drive.

Intake

Line 3 codes the intake. When we press the L up button, the intake spins.

The flywheel turns on when we press the R up button, making the wheels spin very fast.

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TITLE Bad news for the Hang PROJECT

Continued from Page

We discovered a new rule about the hang robot, but we will adapt to this new rule.

New Rule

Added a new rule, now <G19>, stating that Robots which are not contacting the Floor may control a maximum of two (2) Balls

Now, this hang robot can only carry 2 balls at once. We expected to hold multiple balls and then putting them in the high goal. Now, we are only limited to only 2 balls at a time.

Looking Ahead

Although this new rule hurts us a lot, we must adapt to this rule. We hope to get 2 or 3 dumps every game, while high hanging at the end. By practicing, we will still be able to score several points.

Overall, we can still be effective with this robot. By getting at least 2 trips, where we put 2 balls in the high goal every trip. This can score over 40 points, which is still really good in the first competition.

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TITLE Adding on to the Hany Robot PROJECT

Continued from Page

The hany robot is working very well, but we are making some adjustments to make the robot better.

Hang

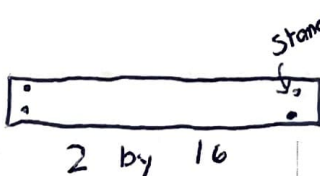
The hang is looking good. The hooks are at the perfect height and the intake is very efficient. The balls are rolling off very well on the cage, while the drive is also good.

Minor Changes

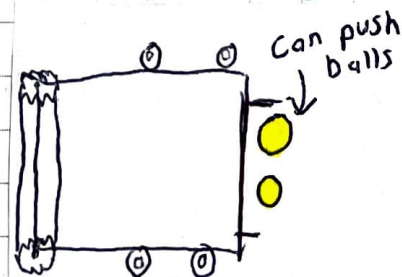
We have found out that the front of our robot cannot push balls in the low goal. By scoring in the low goal, we will get some much needed additional points.

Thus, we are adding a 2 by 16 piece at the front of our robot. There will also be some standoffs so the balls don't fall out. The standoffs will be 2 pieces long.

Front View



Top View



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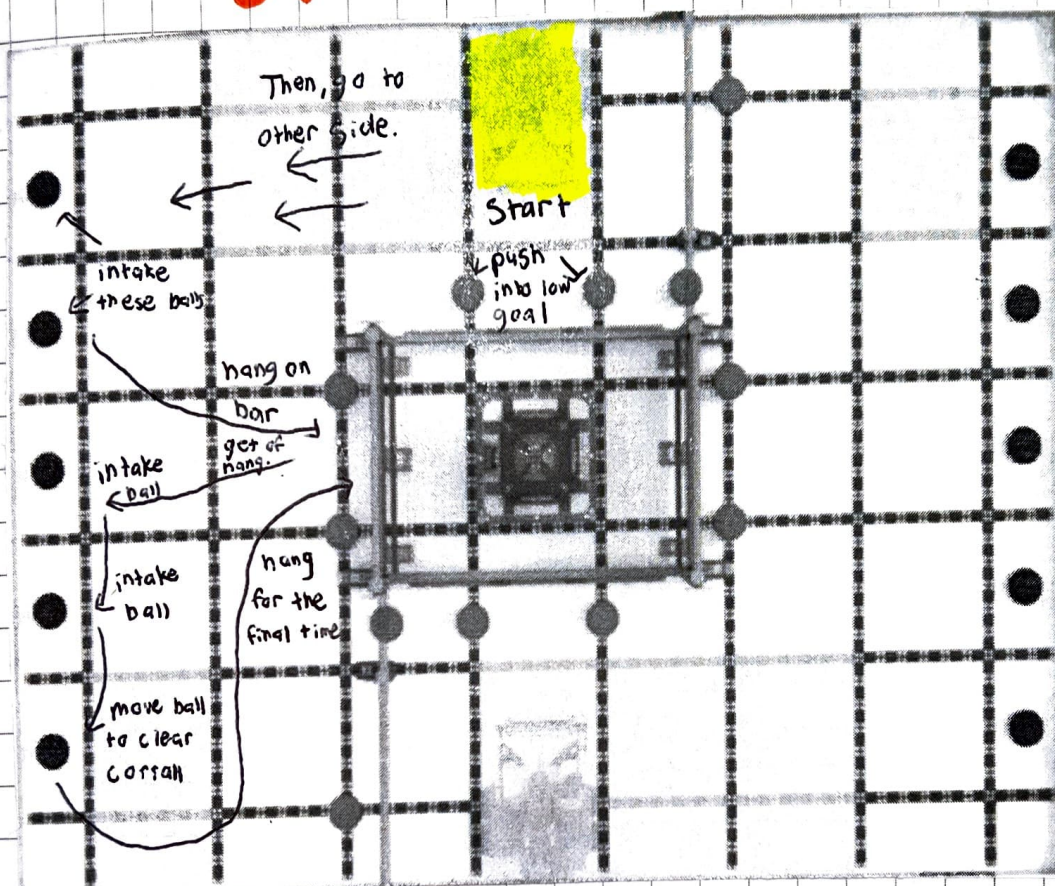
TITLE Strategy for Hang Robot. PROJECT

Continued from Page

After the new rule, we had to change our strategy. This page outlines our current strategy.

Strategy

TOTAL POINTS: 43.



This strategy has proven to be the simplest and most effective. We are also becoming very consistent at getting 43 points.

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TITLE Practice Makes Perfect. PROJECT

Continued from Page

We have finally practiced a lot on the hang robot, with this page outlining our test results

Goal

Our goal is to score 2 balls in the low goal, 4 balls in the high goal, clear the starting Corral and high hang. This combines to 43 points.

Our Scores

We still need practice, but all of us are slowly getting better.

Steven Solo	Steven and Gavin	Ceara and Gavin	Jaxen and Steven
41 points	43 points	32 points	41 points
43 points	29 points	24 points	29 points
29 points	24 points	41 points	32 points

We need to work on our consistency. However, we know that with practice, we can get 43 points almost every match.

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TITLE More practice.

PROJECT

Continued from Page 34

This page shows how we perform with a teammate. The other team also just started practicing, but we will all get better.

Teamwork Scores

* Highlighted are high scores for partners.

Steven Solo (With Another Team)	Steven and Gavin (With Another Team)	Ceara and Gavin (With Another Team)	Jaxen and Steven (With Another Team)
53 points	60 points	46 points	48 points
49 points	49 points	53 points	56 points
72 points	38 points	48 points	38 points

Strategy

- When working with another team, we will use the balls on our side, while the other team uses the ball on their side.

For The Future

- We will continue to practice, using drills and practice matches.
- By practicing more, we will slowly make our averages better.

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TITLE Autonomous: Low Ball.

PROJECT

Continued from Page

This is our autonomous for our hang robot, which will score 2 balls in the low goal

```

1 } turnLeft ( 0.3 , rotations ▾ , 100 );
2 } forward ( 1.6 , rotations ▾ , 100 );
3 } backward ( 1.1 , rotations ▾ , 100 );
4 } turnRight ( 1.3 , rotations ▾ , 100 );
5 } forward ( 0.9 , rotations ▾ , 100 );
6 } turnLeft ( 0.8 , rotations ▾ , 100 );
7 } forward ( 1.2 , rotations ▾ , 100 );
8 } backward ( 0.6 , rotations ▾ , 100 );
9 }

```

Code

This is the code for the low balls. The first 2 ~~ball~~ lines are for the first ball, while the next 6 lines are for the 2nd ball.

- This code has been consistent to get the 2 balls in the low goal.

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TITLE Day before competition

PROJECT

Continued from Page

After practicing for the last two weeks, we have been more consistent.

Are We Ready?

We feel like we are ready. Every one of our duos can score 43 points, with some time left over. For the first comp, 43 points is really good.

Practice

Now, all of our duos get 43 points at a very good rate. We are so much better than 2 weeks ago. Our high score was 80 points.

Goals

We hope to get 1st place. Although we have no idea how the other teams are, we are confident in our abilities.

We hope to average 50 points for this comp.

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We placed 2nd place out of 13 teams, with us averaging 58.17 points on average.

Overall

Our team can agree this comp was a success. Our robot was very consistent, with every team member performing amazing.

Pros

- Our consistency was vital. For 6 out of the 8 rounds, we had 43 points, which ~~is~~ was our goal.
- Our most points was 72, which was one of the best of the whole day.
- The auton worked, giving us 8 additional points. We also got 43 points in skills.

Cons

- The license plate was in a bad spot, with it ~~falling~~ falling in a match. This prevented us from hanging.

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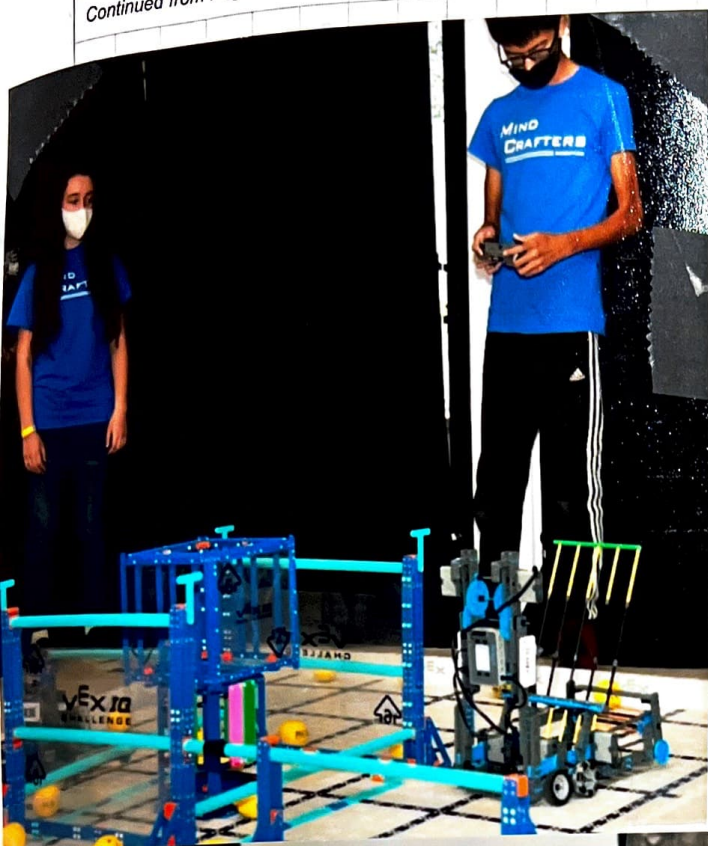
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TITLE Pictures of the 1st Comp. PROJECT

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TITLE Reflecting The First Comp. PROJECT

Continued from Page

This comp was a success overall. Although we wanted 1st place, we proved we are one of the best teams.

How it felt

Even though it was the first competition, our whole team was focused. It was no doubt nervous at times, but we pulled through.

Team Thoughts

- The competition went very well, with us consistently getting 43 points
- We also discovered that we work very well with each other. Like a well oiled machine, we approached every challenge, while also working together.

For The Future

- This hang robot is good, but we plan to start ~~the~~ a new design. We aren't sure if we will have enough time.
- we will ~~continue~~ continue being a powerhouse, as we are ready to become the best team.

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After the first comp, we have a big decision

to make for our future.

- We have only 3 weeks until the next comp. This isn't enough time to build a new robot, so we will most likely keep our robot.

The Conversation

- We can all agree that this hang robot is good, with it being good enough for the 2nd comp.
- Gavin said we should try to improve our design, with us scoring even more points. However, we only have 3 weeks.
- Ceara States that we can make some changes with this robot, with it improving. Therefore, we can score more points efficiently.

Our Decision Decision

- For now, we are most likely to stick with the hang robot.
- We will make some modifications to make the robot better.
- Our team can also work on auton, improving our skills score.

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TITLE Brainstorm for Double Catapult: PROJECT

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After seeing how successful the double catapult is, we are thinking of making one. This page outlines our thoughts

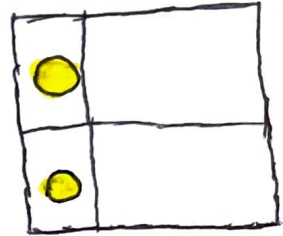
Double Catapult

Pros

- can shoot 2 at a time
- can be consistent
- can hang

Cons

- will take time to find perfect angle.
- big size.



Why It's Good

- The double catapult has proven it can be successful. We have seen teams with it do very well, while also seeing videos about how good the catapult is.

- It can also hang. By adding a hook at the top of the catapult, it should be able to low hang.

How Long Will It Take?

- This robot might take a while to make. My prediction is 1 and a half month. It will take some time, but it can be really good.

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TITLE Improving The Hang Robot

PROJECT

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Before the 2nd competition, we are going to make some more minor changes. This will hopefully make it more efficient

How It Can Improve

- First, it would be good if we could increase the ~~size~~ speed. By being faster, we can be more efficient when moving on the field.
- We can also decrease the size. This will ^{have} ~~be~~ less weight when we are hanging.
- Finally, we need some more support pieces, further fortifying the hang, base and intake.

Giving out Roles

- To assure that everything is done efficiently, roles will be assigned so we will quickly solve these problems.
- Ceara and I will work on decreasing the size.
- Gravin will work on increasing the speed. We also must be sure that the speed isn't too fast, where it is not controllable.
- Taxon will work on the support pieces to make the robot stronger.

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After addressing the aspects we want to improve, we will work on each part, solving all problems

Size

To fix the size, Ceara and I moved the plates connected to the intake about 4 pins closer to the base. We were about 17 inches long, with us now being about 14 inches longer.

Speed

Because we have a 1 to 1 gear ratio, the robot isn't that fast. However, the speed increased when we shrink the length of the robot. Thus, we will keep the speed we have right now.

Support Pieces

Jaren added some more 2 by 16 pieces that connect the robot together.

Jaren also changed some of our pins to double pins. When there are double pins, it is very hard for the pin to fall off.

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Because we will be keeping this hang robot, we have to practice even more.

Just Our Team

Steven Solo	Steven and Gavin	Ceara and Gavin	Jaxen and Steven
43 points	43 points	43 points	43 points
43 points	41 points	39 points	41 points
43 points	43 points	41 points	43 points

Teamwork Practice

Steven Solo (With Another Team)	Steven and Gavin (With Another Team)	Ceara and Gavin (With Another Team)	Jaxen and Steven (With Another Team)
72 points	74 points	64 points	68 points
66 points	64 points	74 points	56 points
80 points	68 points	60 points	72 points

Our team is now consistently averaging 43 points and about 70 points with a teammate.

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BOOK

PAGE

TITLE Day before 2nd competition PROJECT

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The 2nd comp has come very fast. We kept our robot, while making some minor improvements. This page shows our thoughts

Are We Ready?

- Everyone on the team can agree we feel prepared. By using the same robot as the 1st comp, we have had a lot of time to prepare.
- We have improved our consistency, while also being more confident with our robot.

Goals

- We are currently in 2nd place and we want to go for number 1.
- The other teams should be better. Thus, our overall scores should be better.
- We want to be able to score 43 points every match, hoping the other team can score more points.

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TITLE Recap of the 2nd comp. PROJECT

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The 2nd competition has finish, with us still being in 2nd place. We improved our average to 68 points, 10 more than last time.

Overall

- Our team can agree we did very well. Even with the improvement of other teams, we were able to secure 2nd place.
- Our scores were much higher than last comp, with our highest points being 96.

Pros

- We were very consistent again, with us scoring 43 points almost every game.
- We experinced some problems with the hang. However, we were able to solve them.

Cons

- Some of the other teams caught up to us, as we didn't drastically change the robot.
- The cage was to long, and when it shortned it, sometimes the balls didn't roll in.

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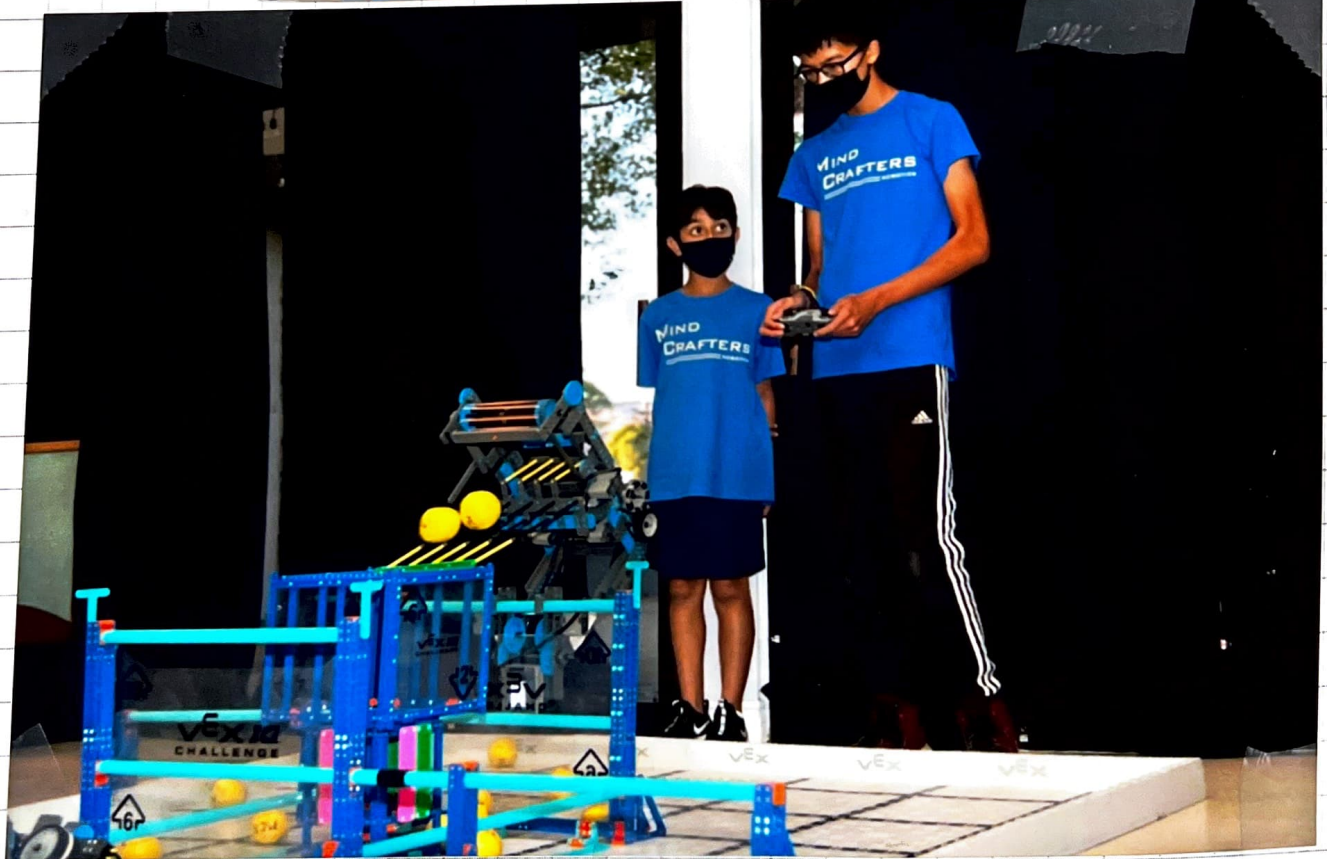
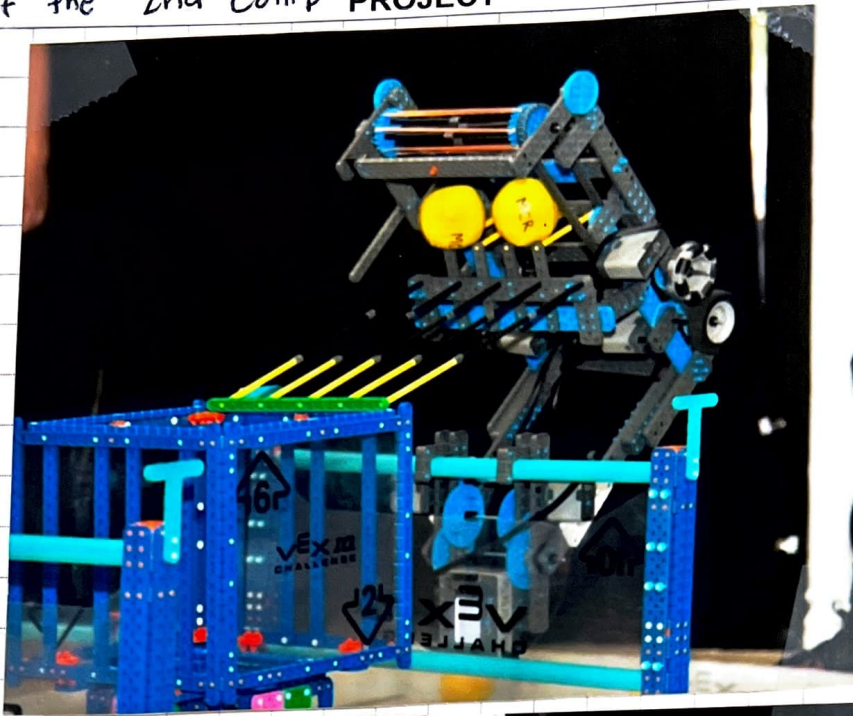
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TITLE Pictures of the 2nd Comp PROJECT

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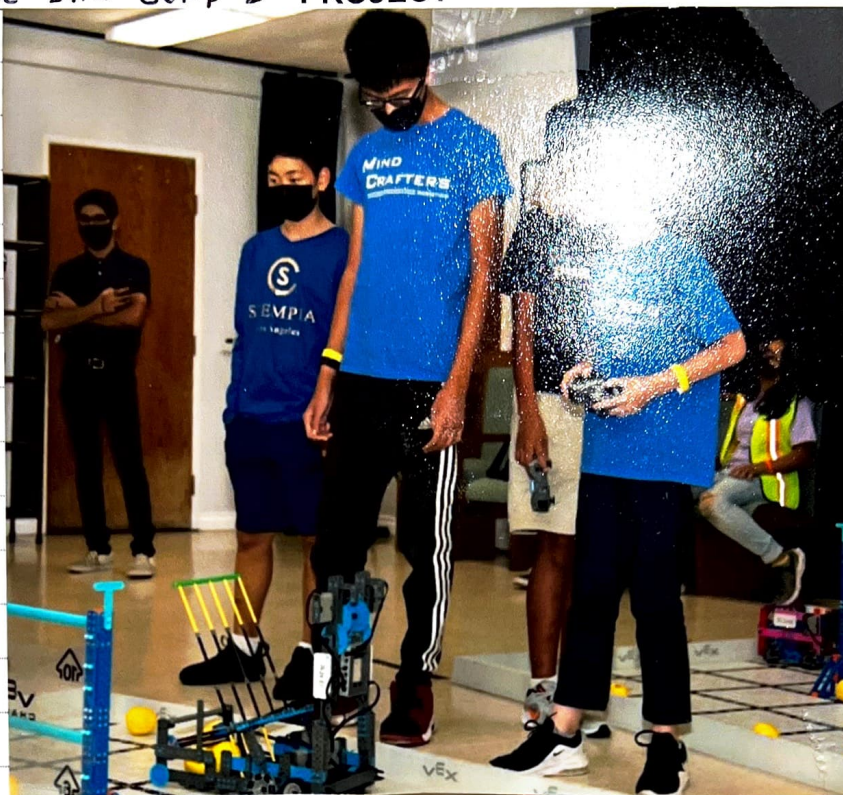
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TITLE Pictures of the 2nd comp 2 PROJECT

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PROPRIETARY INFORMATION

TITLE Reflection of the 2nd comp. PROJECT

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The 2nd comp was also a success. However, the future of the hang robot is unsure. This page shows our thoughts

How It Felt

It was good to still be one of the best teams in the whole competition. Even though all of the other teams improved, we still were a powerhouse.

Team Thoughts

- We were able to get 43 points for most of the rounds, which made our scores very consistent.

- We aren't sure if we will keep this robot for the next comp, but we know we have a high quality robot.

For The Future

- We will be starting the double catapult. Because we have over a month until the next comp, we can start a new robot.

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TITLE Starting The Double Catapult PROJECT

Continued from Page

We will be starting the double catapult, which we know can be very successful. This page outlines our thoughts

To start, we have 4 2 by 20s. Standoffs will connect the plates. This will hold and shoot the balls.

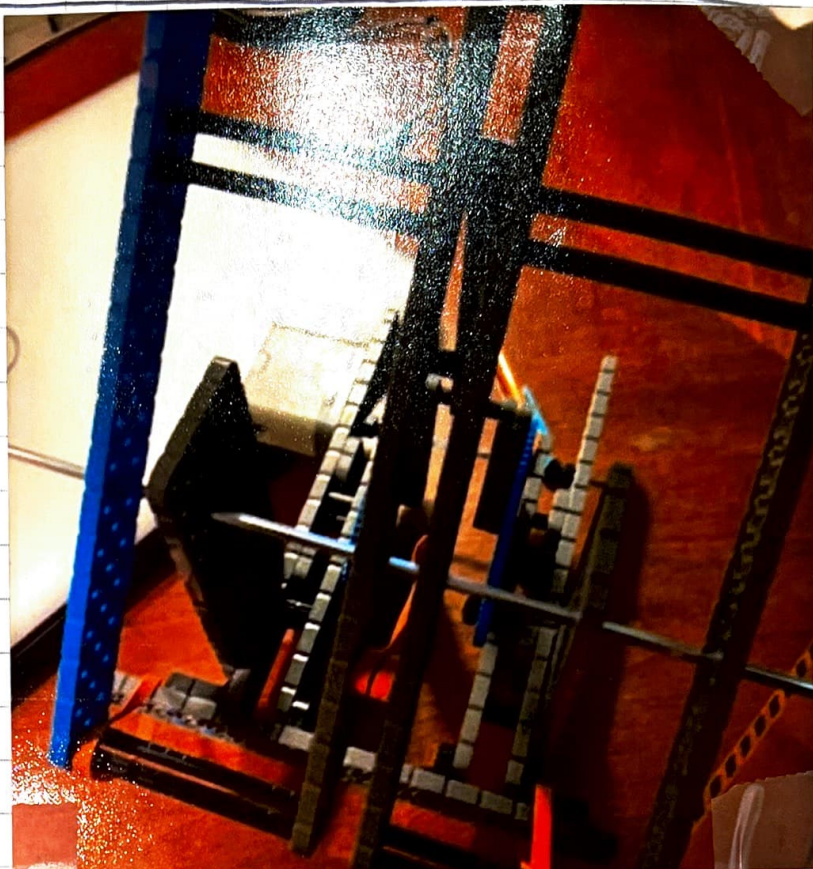
Catapult

- We have a ^{medium} ~~big~~ gear connected to a ^{big} ~~medium~~ gear. The medium gear is connected to the motor.

- When the motor spins, some 1 by 8 plates will move, that connects to a 1 by 12. That is then connected to the ball holder, causing it to lower.

Tension

At the end of the ball holder, there are standoffs that hold rubber bands.



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The Choo Choo mechanism is how the catapult will shoot the balls. This page shows how we will make the mechanism

The Catapult

There will be a gear ratio, with ours currently being a medium to big gear ratio. On the big gear, there are a pivot point, where the plates can move. There is also a stopper. This is a gear slip. When the plates hit the stopper, the catapult lowers. Once the stopper does a 360° , the catapult releases, with the gear slipping.

Fulcrum

The fulcrum point is a pivot point, moving the load. For us, the fulcrum will be a shaft connecting the ball holder to some plate connected to the robot.

Pivot Points

There are many pivot points on the catapult. This allows all parts of the robot to move freely, while staying on the robot. These pivot points can also go up or down, changing how the catapult shoots.

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TITLE Making The Base

PROJECT

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For the double catapult, we want our robot to be very fast. We will also be doing a chain drive

Drive

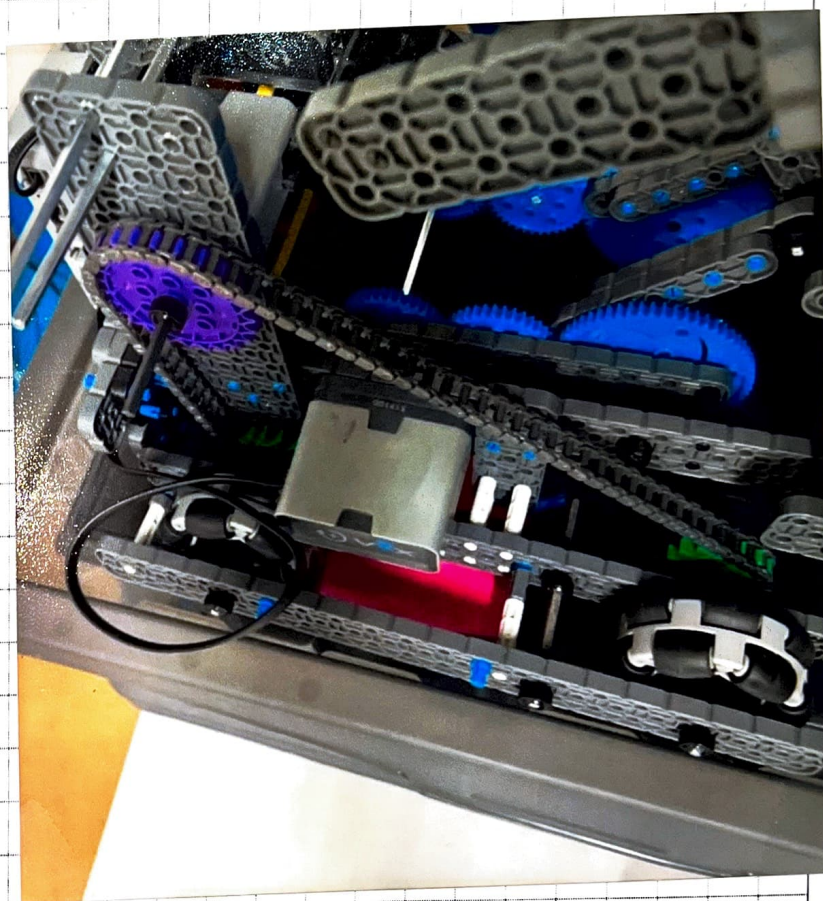
The drive will be connected through chain. There will be a big sprocket connected to two medium sprockets. The motor is elevated, with it being a speed gear ratio. This is a 1:1.5.

Wheels

We will be using 2 omni wheels. There will be a plate on the outside to assure that the wheels remain straight

Width

There will be a 2 by 16 connecting the wheels. This robot will be boxy, with it currently being 10.5 in long



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we have discovered that the catapult has some problems.

The catapult isn't shooting consistently. Thus, we need to improve the catapult

Changes

Because the catapult doesn't work as expected, we need to make some changes. Now, we have two medium gears to a big gear, as it makes more space for the pivot point to move.

Furthermore, we have added another motor to maximize our strength.

The connection point of the plates connected to the big gear to the plate connected to the ball holder has changed. Before, we had standoffs connected them. Now we have a shaft going through the connection



Top View



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TITLE Designing The Intake

PROJECT

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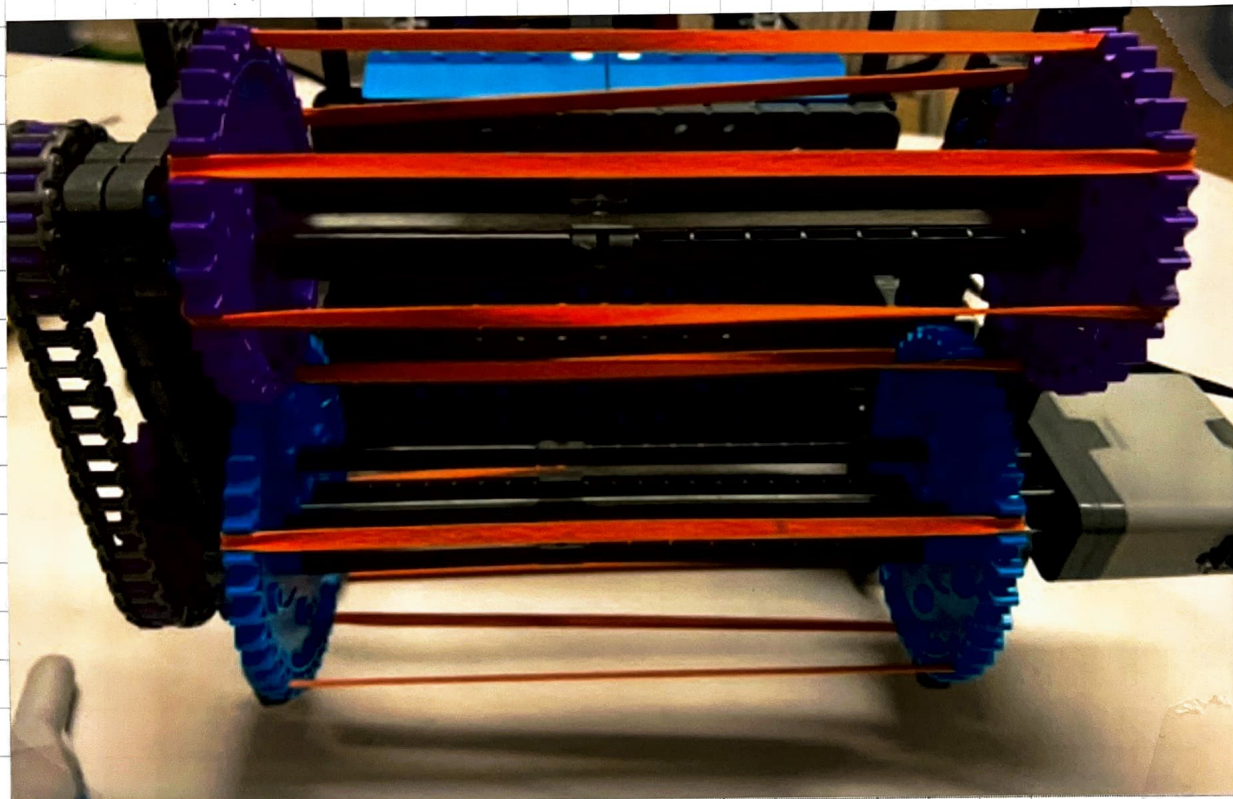
The intake is very important to put the balls in the catapult, with this page showing how we made the intake

Intake

Because the balls have to go up, we need another intake on top.

First, we have a very big sprocket connected through standoffs.

A metal shaft will go through this intake, which connects to the motor,



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This page shows how the intake works, which allows balls to go in the catapult.

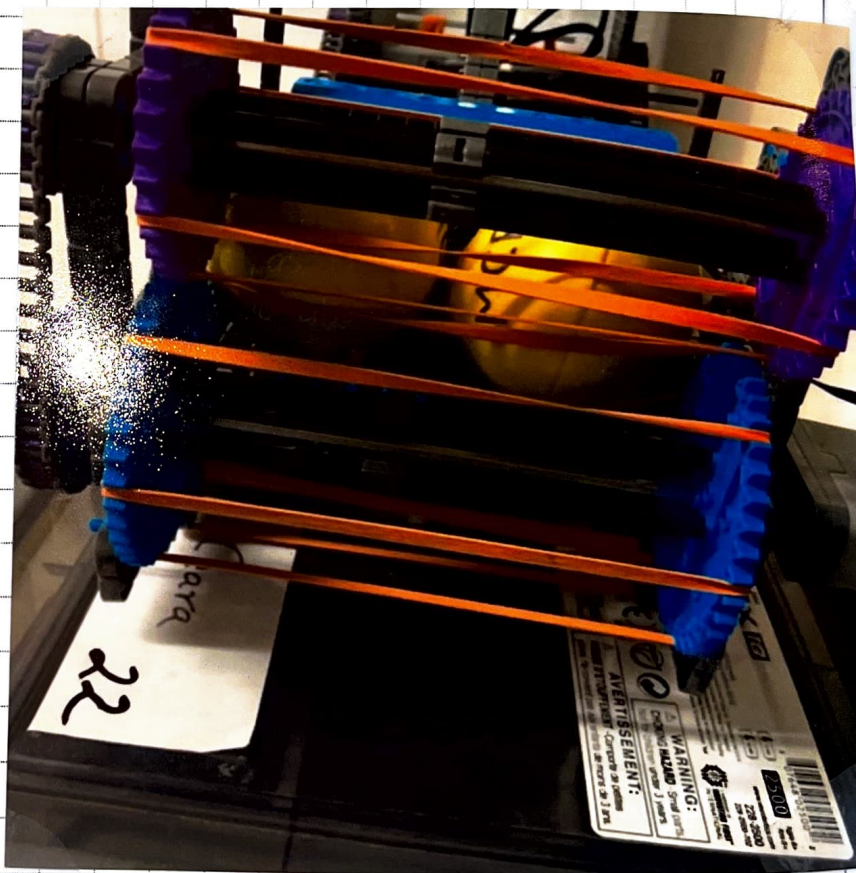
Building

After making the bottom intake, we need to make the top intake.

A Sprocket is on the same shaft as the bottom intake with is being connected to ~~the~~ a small gear at the top. This ratio is a speed ratio, making the intake spin fast.

For the top intake, there is a medium sprocket with rubber bands surrounding it. A shaft will also be going the top intake

Back View



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TITLE Holding The Rubber Bands

PROJECT

Continued from Page

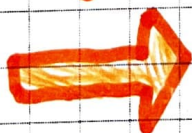
Because the catapult needs tension, the rubber band is necessary for the balls to go in the basket.

Rubber Bands

Before, our team had standoffs going at the end of the catapult. However, there were some problems, with it also being very difficult to put on.

For now, we will have a metal shaft at the end of the catapult, holding the rubber bands.

Back View



A shaft is going through the end of the catapult, holding the rubber bands.

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After finishing the catapult, intake and drive, it's time to test the whole robot.

Catapult

The catapult needs a lot of work, as it has some big problems. There is very little ark, for it isn't even going over the wall. When the catapult shoots, the release point is very high, causing it to not have the proper ark.

Intake

The intake has been a bright spot so far, as it works very well. It can efficiently put balls in the catapult, while also holding 4 balls at once.

Drive

The drive is very fast, with us being able to go across the field easily. The motors for the drive is also not in the way of the catapult which is vital.

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TITLE Making A Mechanical Stop

PROJECT

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Because the catapult has been a disappointing, we need to make some changes. We are thinking of making a mechanical stop, there will be more art.

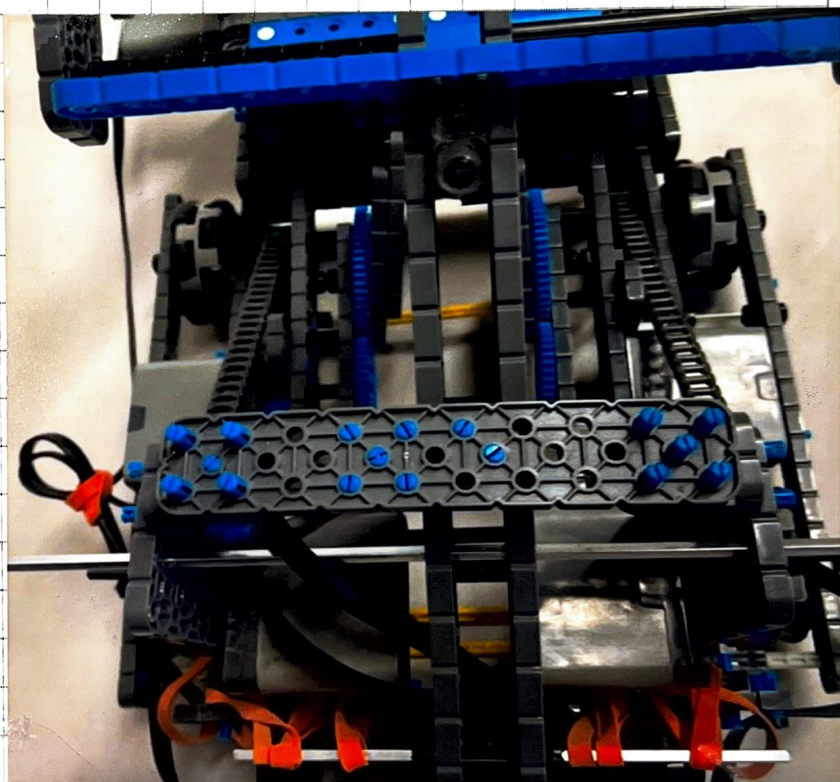
Mechanical Stop

By adding a mechanical stop, the release point of the catapult is lower, causing more art.

- Because we want to go underneath the bar, we don't want the mechanical stop to be too high.

- Thus, we are having a bar plate connected at the plates fulcrum point. This will be highly fortified with double pins.

- This has helped a lot, giving us more art. We also added more rubber bands, having 4 rubber bands on both sides.



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TITLE Testing The Catapult Inore. PROJECT

Continued from Page

After adding the mechanical stop, the Catapult has been a lot better. However, there are still many problems

Tests

- Although the catapult has been better with the mechanical stop, the catapult still needs work. We shot 10 balls, with only 4 of them going in.
- The mechanical stop is still falling off, due to the amount of tension on the robot. Even if it doesn't fall off, it slowly slips off, changing how the catapult shoots.

For The Future

- After trying various different solutions, we have been encountering even more problems.
- The stop is breaking, the catapult hasn't been consistent and it takes over 8 rubber bands to shoot.
- Thus, we are accepting a change with the robot, a way to make the catapult consistent.

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TITLE Changing The Catapult PROJECT

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The Catapult has some serious issues, with us ~~being able~~ wanting to change the mechanism. Therefore, we are making a lot of changes

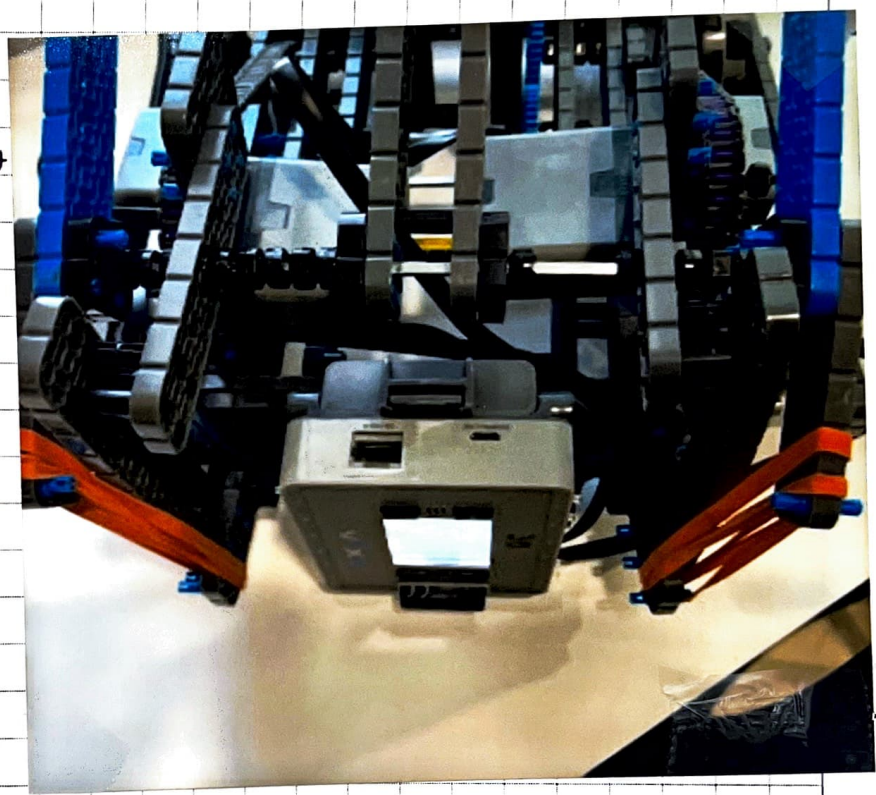
Changes

We have decided to change the fulcrum point of the robot, as we are making the pivot point farther. This gives it more ark.

- We are adding plates at the end of our robot, with us then putting plates going up. The fulcrum shaft goes there.

- Before, the fulcrum went through the 4th hole of the catapult. Now, it goes through the 1st hole.

- The rubber bands will go directly on the robot, with us currently having a doubled rubber band and a normal rubber band.



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This is the code for the catapult this year, which allows us to shoot the Catapult, intake and drive.

Code

```
1 repeat (forever) {  
2   tankControl ( ChA ▾, ChD ▾, 10 );  
3   armControl ( leftcatapultMotor ▾, BtnLUp ▾, BtnLDown ▾, 90 );  
4   armControl ( rightcatapultMotor ▾, BtnLUp ▾, BtnLDown ▾, 90 );  
5   armControl ( intake ▾, BtnRUp ▾, BtnRDown ▾, 90 );  
6 }  
7 }
```

This is the code for the catapult. First, line 2 is for the drive, as it allows us to use the joysticks to control the robot.

Line 3 and 4 is for the catapult. Because the catapult uses 2 motors, the motors must spin at the same time.

Intake

The intake is coded with line 5. When we press the R button, the intake will spin.

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TITLE Final Double Catapult.

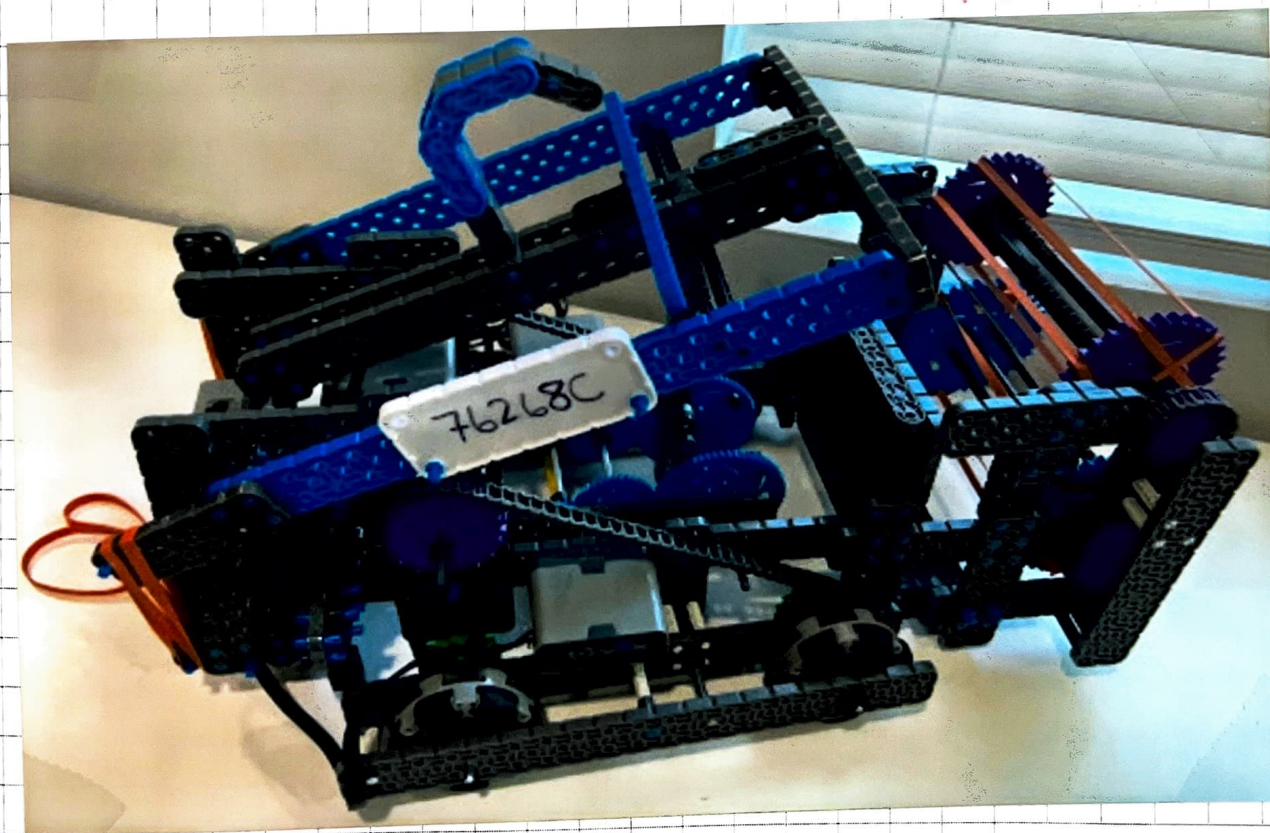
PROJECT

Continued from Page

After various changes, we have finally made a robot that works. This page shows our final robot

Final Robot

- This is our final double catapult design. The drive is very fast, while the catapult works. The intake is also very good.
- The hang doesn't work yet, but we look to improve it soon.
- There are 3 rubber bands on each side, with there being a doubled rubber band and 2 normal ones.



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The catapult has become more consistent, with

this page showing how what the results were.

Tests

- After changing the Catapult, it has been a lot better. We shot 10 balls, with us making 8 of them.
- We still need to find the perfect angle to shoot the balls more consistently.

Positoning

- The positoning of the robot is very vital. For now, we are hitting the wall, then backing up a bit.
- We can't hit the wall as there isn't enough arc in the robot.
- we will continue to test where the perfect spot is to make the Catapult more consistent.

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TITLE Practicing The Robot

PROJECT

Continued from Page

This page shows our scores on the double catapult, and how we improved after more practice

Scores

Steven And Gavin	Steven And Ceara	Steven Solo
25 points	22 points	35 points
36 points	30 points	44 points
40 points	36 points	48 points
50 points	45 points	53 points
55 points	50 points	56 points

- We have found out that the catapult works. At first, we struggled to shoot the balls in the basket consistently.
- By practicing more, we slowly got the hang of the robot, improving our score after every round.
- We started at around 25 points, but we slowly got up to 30, 40 and then 50.
- We discovered some new ways to score points efficiently, which improved our scores a lot.

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TITLE Day before the Final Comp PROJECT

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The final comp is tomorrow, with this page outlining our thoughts. We will try our best as a team, ready to confront any problems

Are We Ready?

- Our team is confident with ourselves, as we believe we can score over 50 points. ~~with~~
- We haven't focused on auton, but we needed all the practice we could get.

Practice

- We are averaging about 45-55 points every game by ourselves. We have found a good position to make the balls consistently

Goals

- We hope to qualify to states, through driving or Excellence Award.
- We are hoping for about 75 points per game.

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TITLE Final Team Meeting.

PROJECT

Continued from Page
Season overall. This page shows our thoughts

Season Overall

This season has been a success. Our team worked like a well oiled machine. We work together very well, making 2 amazing robots.

The Conversation

- I, Steven, was very proud of our team. We were always on task, performing very well.
- Gavin was happy that we fixed our problems, now having a good robot.
- Ceara and Taron hope for the best and are excited for this comp.

For The Future

- We will see how this comp goes, with us hopefully finding success.
- We learned a lot on this team and we will apply it for the future

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TITLE Recap of the 4th comp PROJECT

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The 4th competition has concluded, with it being a success. We qualified for states, winning the teamwork champion award and excellence award.

Overall

we have officially qualified for states, winning 2 awards. Our highest score was 130 points. In the finals, we had to beat 102 points. In the match, ^{our team} we scored 9 balls, and 120 ^{points} ~~balls~~ total.

Pros

- The double catapult was very good, with us consistently getting 8 balls individually.
- The intake was very effective, easily picking up 4 balls.

Cons

- The drive had some problems, but we were able to fix the problem.

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Steven Ty

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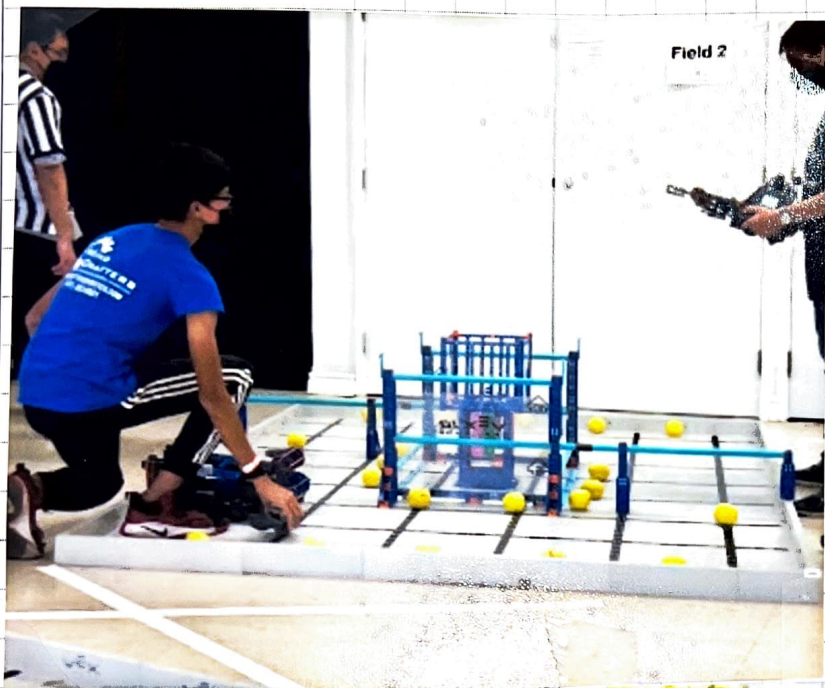
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TITLE Pictures of the 4th comp. PROJECT

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TITLE Reflecting The 4th Comp. PROJECT

Continued from Page

We are very happy that we are going to States with us ready for states. This page shows our reflection

How It Felt

It was very good to see the catapult be consistent. When I, Steven, went solo, we got amazing scores, even getting the best score of the day.

Team Thoughts

Our team is very content with our performance.

Gravin was also happy that we were able to overcome the problems we faced.

For The Future

The catapult is a bit crooked, but it does work. We will see what we do.

We also want to make a hang, which would increase our scores.

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After making States, we had another team meeting to celebrate our success and look for the future

Celebrating

We are very happy in making States, with us having one of the best robots in the competition. We have proven to be a top team.

For The Future

- Although the robot is crooked, this robot works very well.

- For now, we are keeping this robot, as this has proven to work very well.

- We are going to keep on practicing, with us fixing any problems we see.

Potential Changes

- There are some weak points, with us looking to fortify it.

- We also might add some more connecting pieces, as it will make the robot much better and stronger.

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TITLE Practicing The Double Catapult PROJECT

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We need more practice for Gavin, Jaxen and Ceara, with this page showing our scores

Scores

Steven Solo	Steven and Gavin	Ceara and Gavin	Jaxen and Steven
65 points	30 points	20 points	35 points
61 points	36 points	26 points	32 points
65 points	45 points	35 points	43 points
67 points	51 points	43 points	46 points
58 points	65 points	47 points	48 points
65 points	65 points	50 points	53 points

Practice

- Steven Solo is very consistent, but the other dugs are doing better. After getting used to the robot, everyone has improved.
- The other dug started at around 30 points, but we slowly progresed to around 50-60 points
- Gavin has improved a lot, while Jaxen is slowly improving.

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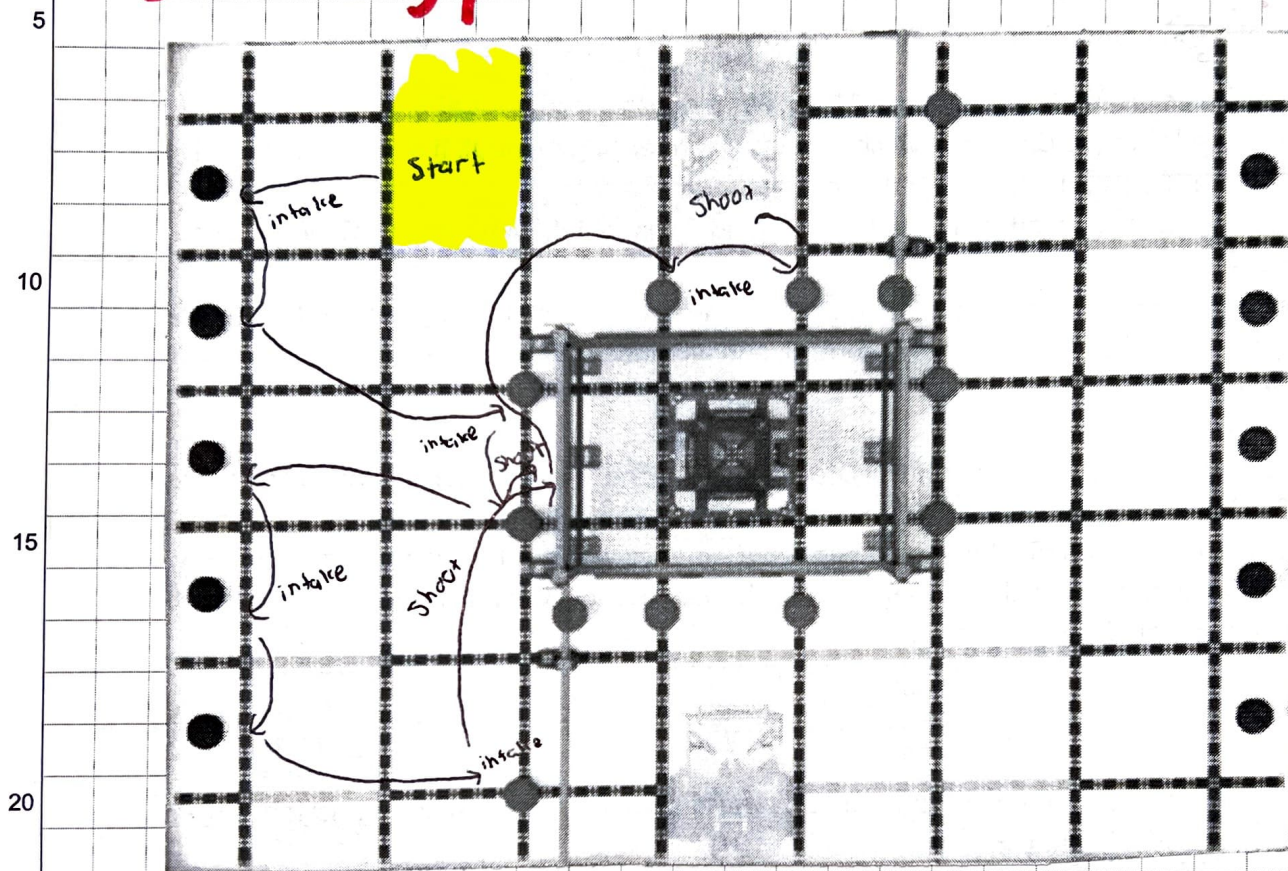
TITLE Strategy for The Double Catapult PROJECT

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This page shows our strategy with the double catapult, allowing us to get the most points possible.

Strategy

Total points: 65 points.



- If done in time, this strategy can score 10 balls in the high goal and clearing a corral.

This Strategy proved to be the easiest and most efficient.

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Steven Ty

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TITLE More practice

PROJECT

Continued from Page

We are now becoming more consistent with the catapult. This page shows our scores and some ways we practiced

Scores

Steven Solo	Steven and Gavin	Ceara and Gavin	Jaxen and Steven
67 points	60 points	56 points	59 points
63 points	66 points	54 points	62 points
63 points	63 points	60 points	57 points
67 points	67 points	53 points	64 points
62 points	65 points	63 points	65 points
65 points	66 points	60 points	63 points

Creative Practice

To increase the efficiency of our practice, we added some stuff to improve our skills.

We had every pair go until they got 10 balls. They had 5 ball attempts, which allowed more repetition for us. The best duo would win the whole game.

This helped us a lot, soon improving our scores and consistency.

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Steven T4

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States is tomorrow, with this page showing our

thoughts

Are We Ready

- We feel like we are ready. We have improved our driving and the overall consistency. We are averaging 65 points by ourselves, which is really good.

Practice

- Practice has gone well, with us getting better.
- Gavin has got really good. Taren has improved so much over the last week and all of us are ready.

Goals

- We want to go to worlds, but we will see.
- We hope to break over 150 points in this comp.

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TITLE Recap of the ^{Stats.} ~~4th~~ 6

PROJECT

Continued from Page

We are going to worlds! We placed 3rd in driving and won the excellence award!

Overall

- Although it didn't start the best, we kept on going. Over time, our scores got good, putting us in 3rd place. It was no doubt a success, as we are going to worlds.

Pros

- Our driving was pretty consistent, with us averaging 9-11 balls. Even without a hang, we were still one of the best teams.
- We started a bit rough, but we persevered and adapted to any situation.

Cons

- The auton wasn't as good as expected, but we still were 6th in skills.
- The hang hurt us, but we will build one on our next robot.

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TITLE Team Meeting #5

PROJECT

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Now that we are in Worlds, we have to further improve.

We are looking to make a new robot that can high hang. This page shows our thoughts.

Celebrating

Qualifying for Worlds is an amazing achievement. Although we didn't have the craziest design, our drivers were amazing, with us getting 3rd place.

For The Future

• Our current robot is very good, but it doesn't have a hang. Thus, it isn't good enough if it cannot hang.

• Thus, we want a new robot that has a consistent catapult and high hang.

• Gavin noted that the catapult must be a single motor, with the hang taking 2 motors.

Possible Solutions

• We will start the new robot, while also keeping our new robot.

• We are ready to face more challenges, while also going past every problem.

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BOOK

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PROJECT

TITLE Planning for Worlds.

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Because we only have 2 months to build,
program and drive. Thus, we are making a timeline for our new robot.

Timeline

To make everything organized, we are making a timeline to assure we have a strong plan. Worlds is on May 6th, with us wanting at least 3 weeks to practice.

Dates

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TITLE Starting The Base

PROJECT

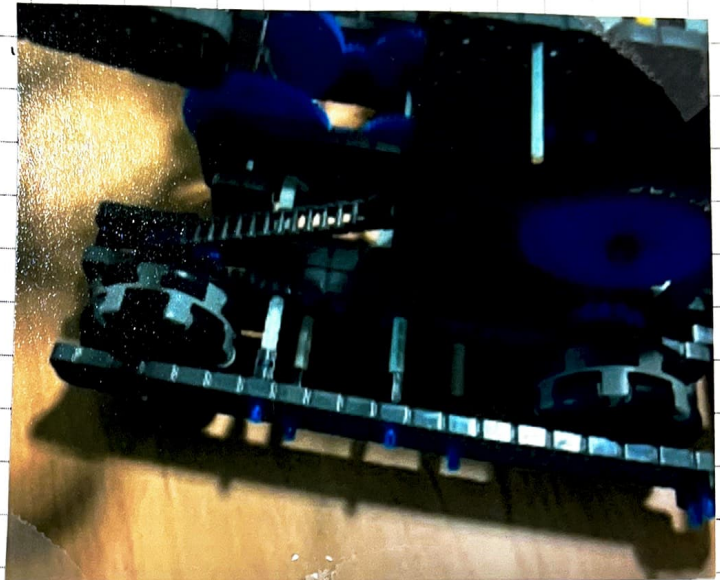
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we are going to make our base first. The drive must be fast, while we ^{must} have enough space for the catapult, hang and intake

Drive

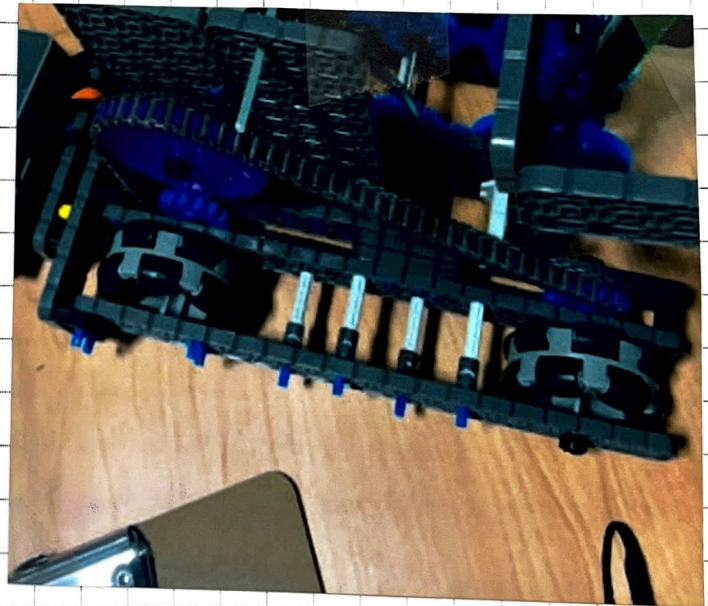
We first had a medium sprocket (16 teeth) connected to a small sprocket (16 teeth).

Even though it was fast, we still want it faster. So, we had a big sprocket (24 teeth) connected to 2 small sprockets through chain. It was very fast and we are happy with it.



Base Size

For the base size, we have 2 2 by 20s. The wheel is then connected, with there also being an outer rail to further support the wheels.



↑ Side View ↑

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The catapult is the most important part of the robot we must use only 1 motor, which makes it much harder.

Gear Box

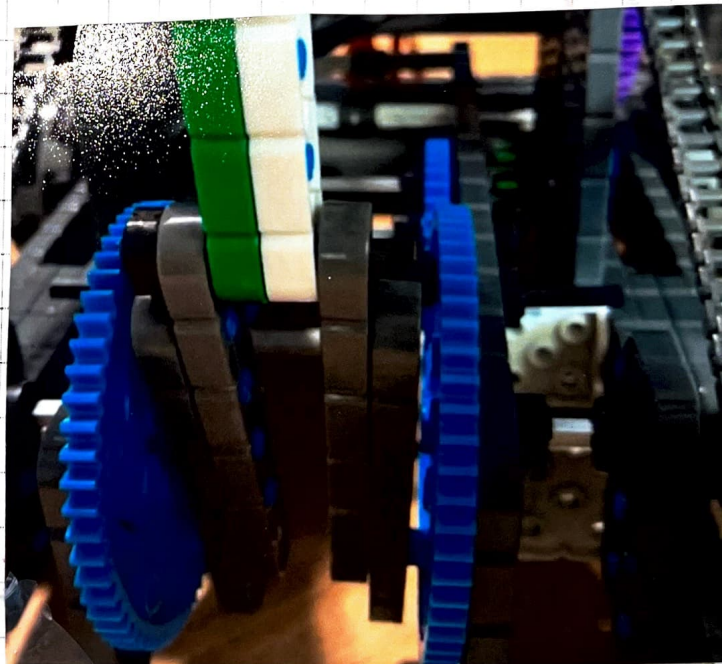
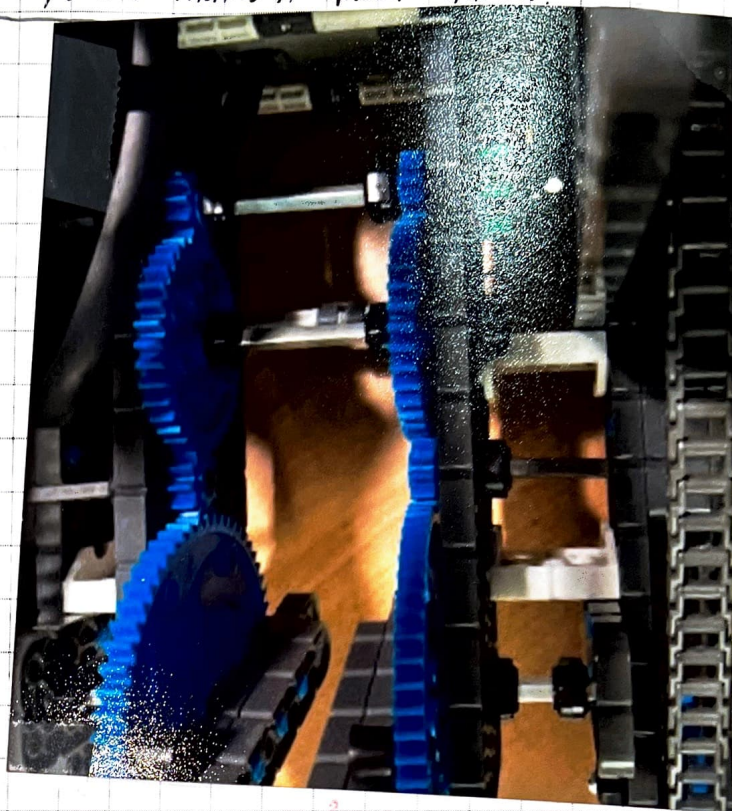
On our previous robot, we used 2 motors, increasing the power.

Our new gear box is the motor connected to a small sprocket, which connects to another small sprocket. The sprockets are connected through chain. Then, the sprocket is on the same shaft as a small gear.

The small gear connects to a medium gear, which then connects to a big gear. This is a 5:1 gear reduction.

- The box is the size of a motor, as it allows more space for outside rails.

. We might add another small gear to improve the spacing. It is an Idler gear, with it not changing the gear ratio.



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