Vex Documentation

Planning

8/7 First Ideas

It's a game with a lot of triballs so need speed and want to climb over barrier so we need minimal gap between wheels.

Add diagram

6x 4in Lite 315B

8x 3.25in L:te 1045R

We choose 4in wheels at 343 rpm geared down from a 600rpm gearbox as it would mean there is a small gear between the two wheels meaning the drive train will go over the barrier smoother. Last year we direct drived 200 rpm and we found it to be very slow so we decided to make our drivetrain faster. We thought this would be fast but were slightly concened it would not have enough torque bet decided we had time to test it out.

In terms of shooting, we saw that there are alot of preloads and thought that it can be used to gain a lot of points, while at worlds we also heard many discuss about how the triball is larger than the height of the goal so we need a strong shooter. The three main types were:

Add Photos

Catapult 7492BZ

Flywheel MARC

Puncher Akira

The wheels avalible to us were 4in and 3.25in; we gvessed 4in would be able to go over barrier easily but 3.25in would need sleeds. We decided 4in because we thought sleds were an extra complication.

The flywheel was what we used in the previous game but our main issue was that the flywheel takes time to spin up before it can shoot and it needs to spin up again after each shot. A issue we expect to run into is the flywheel not griping the game element well as it is oddly shaped (rectcaux tetrahedron) and not being able to shoot well.

The puncher was a shooting method that worked quite well although our main concern was that it was very large

The catapult fits all our requirements but we were afraid the shooting would cause the robot to shake a lot.

We ended up choosing catapult but kept puncher as a future option.

Motor distribution:
As we only have a limited number of motors (8), we needed to use it wisely. We wanted a fast drivetrain which means the drive train needs a lot of power for it to have torque to spin. We thought: 6m dt, 1m cata, 1m intake. One of the things we wanted to do last season was a PTO or a trasmission. We wanted the drivetrain to have 6m when we want to drive fast, and when we stop to shoot, the drivetrain changes into 4m and 3m cata. We wanted this although, because of it's complexity, we knew we might do it in the future.

Strategy
3/17
We first thought of the ways to gain points and prevent other side from gaining points.

Offensive	Defensive
Matchload	Blocking Matchload
Push with wings into goal	Push out of Goal
Endgame	

A lot of the tri balls are matchload so we want a fast shooter. We will shoot to the other side then push with wings all triballs into goal. We also want a large blocker to prevent other side from shooting. And we wanted to climb for extra 20 points although we decided it wasn't worth the effort as we can be pushing 4 triballs.

Pivot 2 — The most common bot was 229V which can shoot well and has wings but is too tall for pushing out of the goal.

Pivot 1 — One of the things we wanted is to be able to be both offensive and defensive as we won't know who our alliance is. A robot from 21417A inspired us as it was a low robot that did everything except blocking which we think we can add giving us a very well rounded bot.

3 CAD 7/8 - 10/8

We wanted a very low friction drivetrain so we wanted to use screw joints. The issue is that the longest screws are 2.5 meaning 4 wide gap for][but that means if we get hit from the side our robot would be easily damaged, or a 3w gap for][. So if we want the robot to be able to wistand robots push from side, we need 3 wide. Our 4in wheels fit in 3w gap with 0.005in of tolerance which is way to tight the newer antistatic 4in wheels fit though we dont have it. This is why we choose 3.25in wheels + it also allows the drivetrain to be lower and giving us more room above to build. We made a comparison between diffrent gear ratios, taking into concideration: RPM, Torque, and gear size spacing. We choose 360 rpm as it was fast, (1.4 x last year at 6 in/s), it had decent torque, (some teams at worlds run 8 in/s), and had a decent gap between wheels at 4 in.

We wanted to do 400 rpm but relized we do not have 48 or 72 teeth gears

We were unsure weather to pick 6 or 8 wheels but decided to use 6 wheels. 8 wheels allows for a longer robot but we agreed to try to make a small robot.

we use zipties instead of screws to save weight on the shaft bearings as it does not experience alot of stress

Building 12/8 - 13/8

Since we had the CAD done, we wanted to finish building in a week ad (spoilers that didn't happen). Our main issue was we didn't bring enough parts: long screws and drill. We did not bring enough 2.5in screws and the 60t gear needs to be drilled for a shaft / screw to freely We decided to do a slightly thicker shaft version. One thing we discovered was that brass inserts spin with less inserts than plastic green inserts.

On the 15th we finished building one side with screw joints and on the 17th we finished the drivetrain with electronics attached and driving. We also have a proof of concept for the wings done

We cut the sleds on the 18th using a CO2 laser cutter out of polycarbonate but it kept burning. Our sleds came out looking a bit burnt and it did not cut through fully so we had to break it by bending and use the drill press to make the screw holes.
On the 21st we got everything mounted and 24th we wired pnumatics and got it driving.

9 2/9 Alex got 1st Virtual skills w/ 72 points

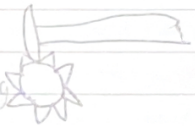
7/9 The issue last year with collar locks were they loosen with vibration. For regular screws we solve this with nylock but for collar lock, the best solution is loctite. We ordered some from China and it acts similar to glue but with enough force, it still can be taken apart. We put it on all collar locks of our drive train.

Spliting Roles 9/9
Now that we have the drivetrain complete we can work on multiple parts of the robot at once
Sleds Bao Nhi
Our sleds were functional but kept breaking and didn't go over the bars smoothly. We will change the sled shape.
Wings Jack
Our wings currently has one problem which is, it isn't strong enough. When pushing a lot of triballs, the wings will bend back words. This is exagerated after 1 minute of opening and closing when we go lower pressure. We solve this by using latex wings similar to 2147A
Catn Alex Wayne
We wanted a fast catapult for match load so we chose 33 rpm as it was fast and only uses small gears 36 and 12 teeth. We got a proof of concept done and a CAD.

Rachet 15/9
We needed a rachet in order to reduce strain on motor. Normaly, if the catapult is down, there are rubberbands that try to pull it up and the motor will have to hold it but with a rachet

the stress will be on the rachet instead of motor. this will also mean if the robot is turned off, the cata won't fling up.

Our first ide was making the screw perpendicular to
11 the gear which kind of works but with enough force it will still spin the other way



photo

Our next idea was inspired by 2654P. When we spin it anti-clockwise, the gear pushes the screw head up, when we spin clockwise, the gear pulls the screw down and to
12 the left but the secret is to make the screw long enough so that it can't go to the right which makes it very tight.

(WWW + Alex sick)

6/10
Wayne makes V1 of cata
9/10 Mounted and test,
13 It shoots but not enough power
We need more bands
14/10 Wayne cards V2