

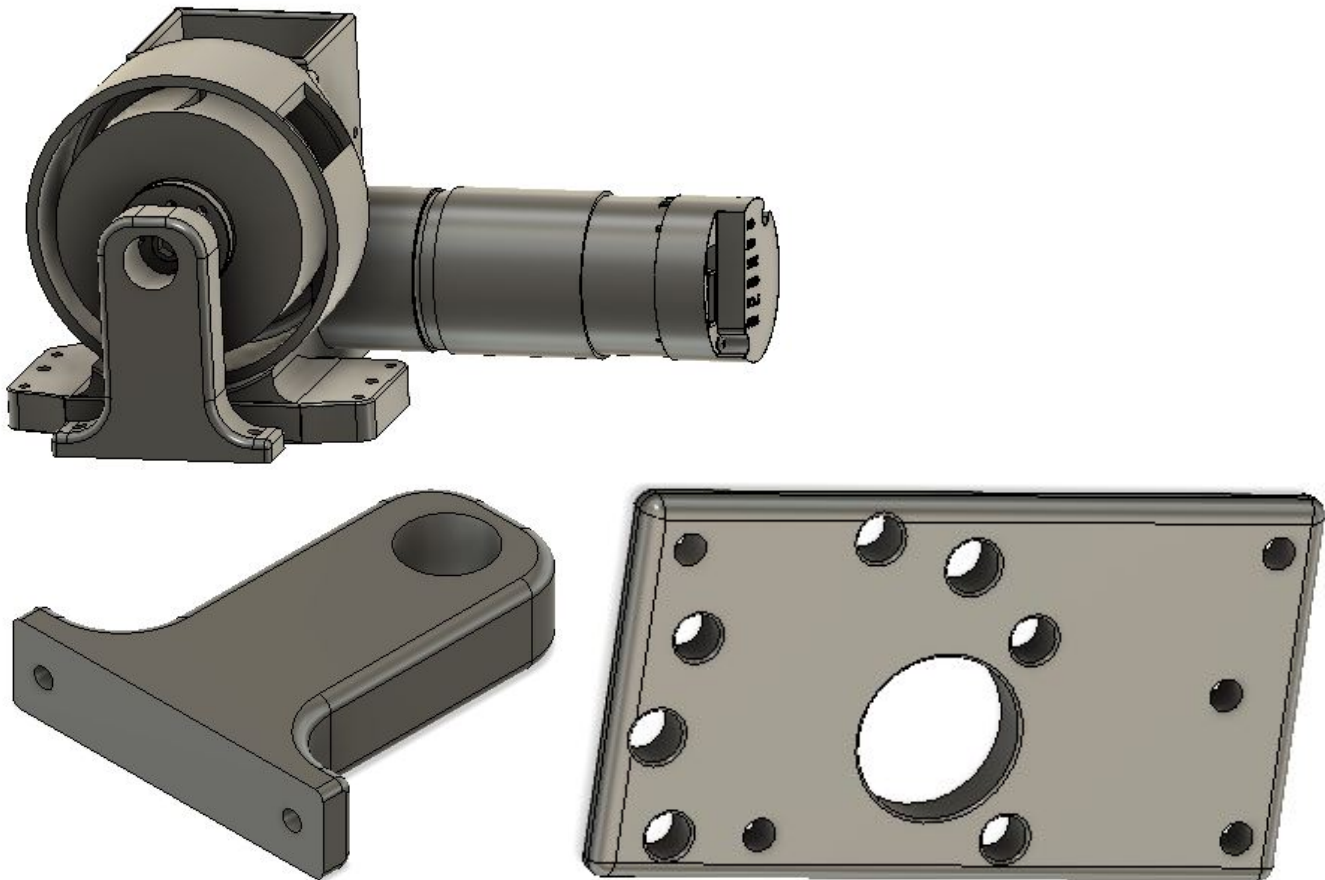
Date: Fri, 12/21/2018Location: Belbas HousePurpose: Team Meeting #27Attendees: Luke, Mark, Zach, Andrew, Joel, Ben, Coach BelbasAgenda:

- Work on Eng Notebook
- CAD
- Assemble and test elbow joint pieces

Reflections:

In the beginning of the team meeting, we discussed various topics such as the arm, programming updates, motor choices, and our worm gear. After our rather long "Fifteen minute stand up meeting", we divided into subgroups:

- Luke (Engineering Notebook): Today I worked on the Engineering Log for chapter three. I also started the fifth chapter (The one you are currently reading now).
- CAD (Joel): Today I worked on getting our winch ready to print. I started this design at home, but had to make some changes today. These changes included designing a motor mount plate which will attach to the winch, changing the drum size for a smaller tape measure, and adding a support for the other side of the axle to keep it from bending. Pictured below is the support, the motor attachment plate, the spool, and the entire assembly.



Zach: Prior to the meeting, we 3D printed the elbow joint pieces I have been working on in CAD. Coach Belbas taught me how to cast a mold in Fusion 360, and we were able to design and print one for the worm gear assembly. This was very nice and greatly reduced the time needed to assemble the worm gear. I assembled the worm gear in the elbow joint, and there was a slight misalignment in the gears, so I will fix that in CAD. Also, the pivot piece fits nicely with the metal REV support piece.

Date: Sat, 12/22/18**Location:** Belbas House**Purpose:** Notebook Subgroup**Attendees:** Luke, Andrew, Coach Belbas**Agenda:**

- Work on Eng Notebook

Reflections:

We worked on the outreach documentation today. Luke went through all the outreach events the team has done and made one-page documentation templates for them as well as filling a few with texts and images. Andrew worked behind him filling in the templates he couldn't do. Coach Belbas went through all of her pictures and separated them into the different events. We completed 20 outreach documents:

- Wood
- UTC
- Sep Prg Workshop
- Schneider
- San Jac WorkShop
- FTC Mentoring
- FLL Mentoring
- FLL Jr. Coaching
- Mechatronics
- Jr FLL Intro
- Jacobs Outreach
- Humphrey
- Houston Maker Faire (needs pics)
- FLL Practice Qualifier
- Intro FLL WorkShop
- FIRST Like a Girl
- EPO Trip
- Jr FLL Coaching
- Bailey Orthodontics (needs pics)
- Autodesk Outreach

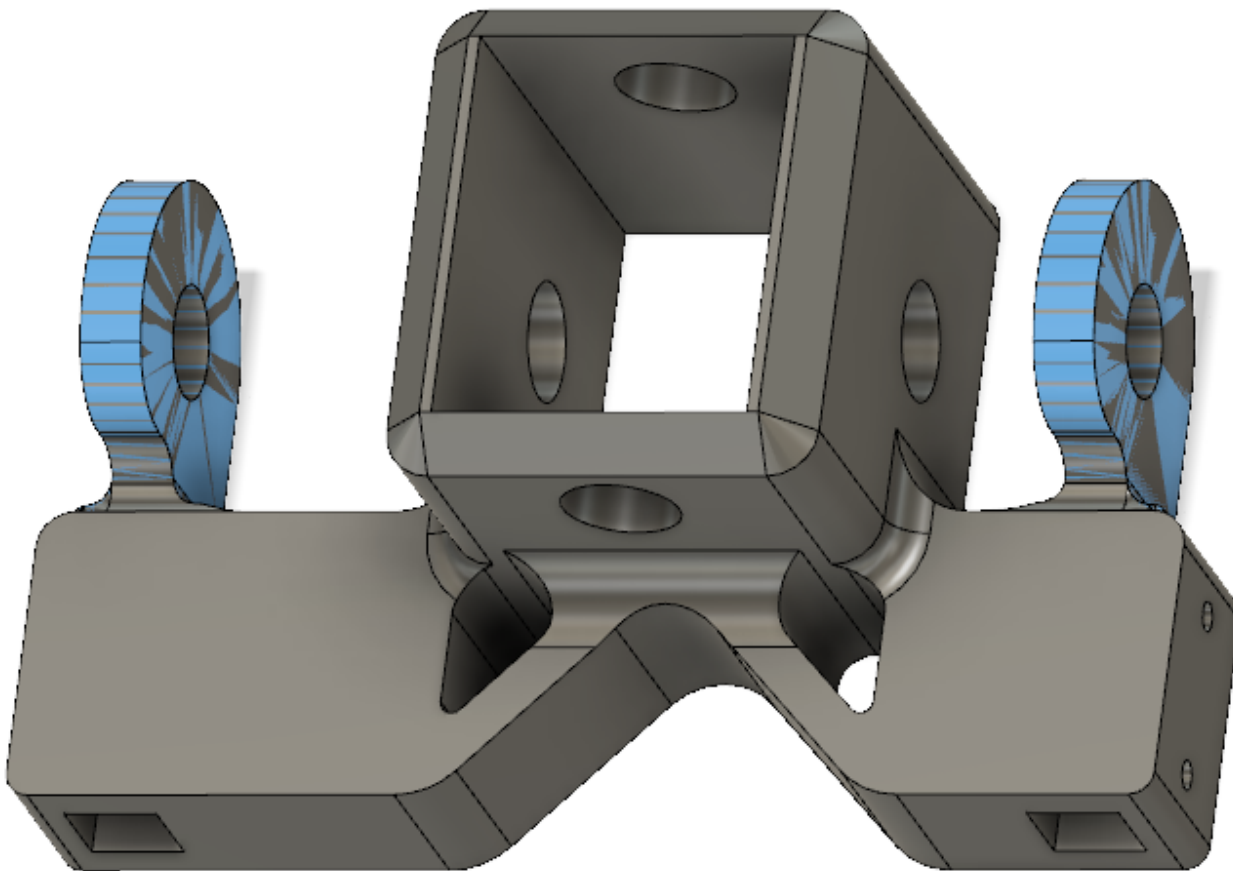
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Date: Sat, 12/22/18**Location:** Hash House**Purpose:** Mechanical Subgroup**Attendees:** Zach**Agenda:**

- Work on CAD of elbow joint

Reflections:

Today I worked on the CAD of the elbow joint. I edited the joint to fit the smaller carbon fiber tubing, which will allow for more room in the middle of the chassis for the hanger. I also fixed the misalignment in the holes for the worm gear assembly.



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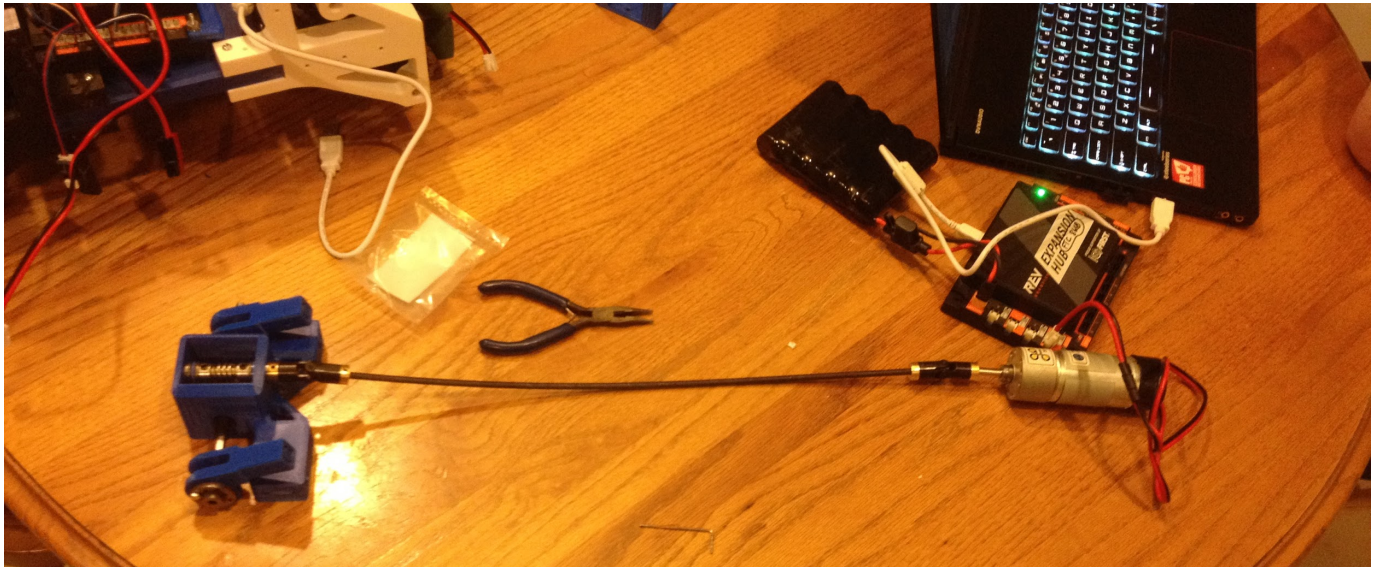
Date: Fri, 12/28/18**Location:** Belbas House**Purpose:** Team Meeting #28**Attendees:** Zach, Mariah, Joel**Agenda:**

- Test elbow worm gear
- Wiring

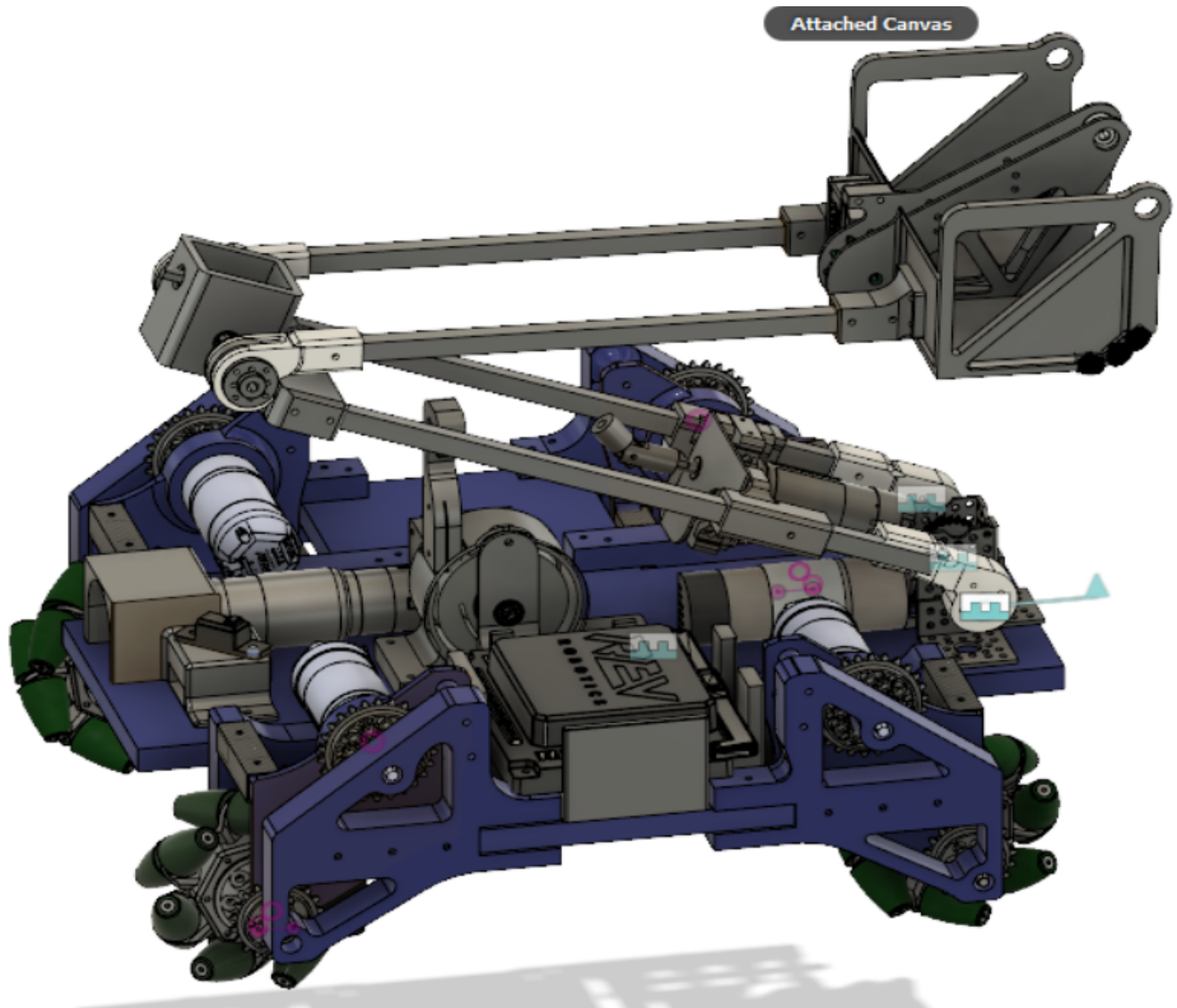
Reflections:

Today, we tested the elbow worm gear with the flexible shaft. We hope to use the flexible shaft because the elbow motor and elbow joint are not perfectly in-line. Also, we want to pull the joint to the side to allow our winch to sit in the middle of the robot. The initial test went well. The flexible shaft was able to lift the arm and it was pretty fast. The true test, though, will be when the collector is added because the arm will weigh more.

Mariah: I spent time today learning how to make custom wires. We need to keep our wiring neat and moved off to the side to make room for the winch in the middle of the robot.



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Date: Fri, 1/4/19**Location:** Belbas House**Purpose:** Team Meeting #29**Attendees:** Joel, Luke, Zach, Mariah, Andrew, Ben, Mr. Lee, Coach Belbas**Agenda:**

- Create Molds with CAD
- Work on winch

Reflections:

Joel: Today I made some minor changes to the winch. The main change was the moving of the slot from one side to the other. Then, I learned how to create a mold which can be used to hold all the parts like the worm gear and spacers and make assembling the mechanisms a much easier task. A picture is attached below. Using this simple design, will enable us to simply align the mold then run the axle through.

Zach: I continued working on design of the motor mounts for the elbow. (CAD shown below).

Programming (Andrew, Ben): Our focus today was the autonomous. While Ben hammered out a skeleton class for the hanging feature, Andrew began working on integrating the tensor flow algorithm into our working autonomous. Mr. Lee helped us step through the needed actions. Right now, the robot will find the gold mineral, drive forward and out from under the lander, and then turn to face the gold mineral. We plan to add arm movements in once the arm is complete and on the robot. Basically the robot will find the gold mineral, remove it with the arm, and then deposit the mineral and the team marker in the depo before driving to the crater. Ben and Andrew also did a long video call with Robo Sapiens, helping them work through some issues they are having with their camera and finding the minerals. We were able to help them some, but weren't able to fix all the problems. They sent us their code so that Andrew could look it over and try and fix the problems.

Luke: Today I worked on assembling the elbow joint. It was a very tedious process due to small work space. The mold to hold the parts was a little difficult to use, however it got the job done. I also did some research on the Google Drive to see what others have previously done for the piece. After the prototype was assembled, I also did some minor tweaking to the notebook, specifically, the Engineering Log.

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Date: Mon, 1/7/19**Location:** Belbas House**Purpose:** Team Meeting #30**Attendees:** Joel, Zach, Mariah, Andrew, Ben, Mr. Lee, Coach Belbas**Agenda:**

- Create Molds with CAD
- Work on winch
- Finish CAD on elbow motor mount

Reflections:

Joel: This evening I worked on the hanger assembly. I worked with Zach to verify that all dimensions were correct and would not interfere with his arm assembly. Then, a new motor mount for the planetary motor was made. Next, a notch was cut into the gearbox to allow space for the rod which will go above. Attached below are pictures of what was accomplished.

Programming (Andrew, Ben): Today we worked on finalizing the tensor flow code and completing the class skeleton for the hanging mechanism. Andrew continued to debug the tensor flow code. The autonomous can now find the gold mineral and drive to it. One issue he had was that in order for the code from FIRST to work, sensor flow had to only see three objects. So if it saw four objects or two objects, the code wouldn't execute, even if it saw the gold mineral. Andrew changed the code to use the x-position of the gold mineral specifically (not the x position of all three minerals). With that change, the tensor flow code is much more robust. Ben finished creating the hanging class with some sample values that can be tested once the hanging device is built. The autonomous with vuforia navigation is ready to be tested. Vuforia navigation autonomous should tell the robot to find a navigation target and run the specified drive path based upon what target it read.

Mark: Today, I worked on assembling the new collector design. I altered the design of the box to use a 36 tooth and 12 tooth 3D printer pulleys to increase the speed. All of the dimensions are correct and it should work well. There is a problem with the casters on the base breaking and being too tight for the bearings to roll smoothly. We will have to splice the belt to the correct length between the pulleys and this will be accomplished over the week.

Zach: Today I finished work on the mount for the elbow motor as well as the brace for the elbow motor. This will help minimize the weight farther down the arm.

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Date: Wed, 1/9/19**Location:** Belbas House**Purpose:** Team Meeting #31**Attendees:** Andrew, Ben, Joel, Zach, Mariah, Coach Belbas**Agenda:**

- Work on winch mechanism
- Work on arm worm gear box mechanism
- Programming stuff
- Soldering stuff

Reflections:

Joel: The changes implemented in CAD last meeting were implemented whenever the lifter was reprinted in a sharp looking translucent white color. Both worm gear and regular gear were inserted and seemed to fit; however, whenever connected to a motor, the mechanism binded. On one occurrence, the gear worked perfectly for half a rotation then it jammed. Later, upon examining an axle, we found that the axle was not perfectly straight. A corrupted axle seemed like a likely cause, however, whenever we tested another axle, it seemed just as bad as the first. I'm wondering if the issue is caused by a slight issue in spacing of the holes. Worm gears require very exact dimensions to function properly. The next part of this mechanism I worked on was the drum. I measured the tape measure will need to be 25 inches in order to give us adequate reach and to allow for one rotation around the drum to increase friction and reduce the risk of the tape being ripped out. The current drum had some problems with the tape sliding into its designated slot. I made some modifications to the CAD to make the slot longer and wider. It should be reprinted by Friday. I will continue work on this mechanism on Friday. More subgroup meetings might be necessary to get this mechanism ready for action.

Andrew: I taught Ben and Mariah how to solder. Together we made some rev power cables. I also cut, filed, and attached two aluminum braces to the bottom of the chassis in front to strengthen the chassis (it was bending under the weight of the arm).

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Date: Thurs, 1/10/19**Location:** Belbas House**Purpose:** Subgroup Meeting**Attendees:** Andrew, Ben**Agenda:**

- Working on wiring and attaching the new arm
- General wiring for the whole robot

Reflections:

Ben: I worked on attaching the new arm onto the chassis and fixing any major issues with the worm gears. The shoulder worm gear was very loose and had a lot of backlash. We reassembled the worm gear and added 3d printed parts to reduce the amount of backlash. I also ran the arm with the Rev Hub Interface to see what power values would affect the arm and or allow the arm to move efficiently.

Andrew: I did wires. Different types of encoder wires, servo wires, power wires, everything. Each wire had to be measured for where it needed to go and then built. I spent over eight hours crimping and soldering wires today.

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Date: Fri, 1/11/19**Location:** Belbas House**Purpose:** Team Meeting #32**Attendees:** Andrew, Ben, Mark, Zach, Mariah, Joel, Luke, Coach Belbas**Agenda:**

- Rout the wires on the robot
- Get teleop and arm controls working

Reflections:

Andrew: I finished up the wiring from yesterday and routed all the wires. The wires had to be strategically routed to allow for easy disconnection from the various modules, but also to be out of the way and wrapped in protective casing whenever possible.

(Mechanical) Luke and Joel: Today we took a break from the hanger and began assembly of a backup shoulder for the arm. The current shoulder is taking so much wear and tear from practice that it seems unlikely that it should survive the meet next week. Fortunately, we kept modularity in mind while designing the shoulder, this will make it much easier to replace in the event of a disaster. Also, we used the grinder for the first time this year on the sharp edges of the Tetrix channels.

Mark: Today, I begun the testing of the new collection box that uses pulleys instead of direct drive. However, there is a problem with the pulleys and belt slipping because of the extra strain from pulling the minerals in. The belt and pulleys we are using have a very fine tooth size for accuracy not torque transmission so there is no way to fix this other than getting a heavier duty belt and pulley which would widen and add weight to the box. So after brainstorming we have decided to look at using a vex chain and sprocket combination which will give us gearing for speed and the necessary torque transmission.

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Date: Mon, 1/14/19**Location:** Belbas House**Purpose:** Team Meeting #33**Attendees:** Andrew, Ben, Mark, Zach, Mariah, Joel, Luke, Coach Belbas**Agenda:**

- Attach collector
- Autonomous work

Reflections:

Mechanical (Zach, Joel): Today we worked on attaching the collector to the end of the arm along with some brackets for attachment to the carbon fiber tubing. The collector is now attached to the robot and (kind of) functional.

Ben: I worked on adding in arm functionality into the autonomous code. The arm needs to knock off the gold mineral at the beginning of autonomous after tensorflow and at the end it needs to extend over the crater wall. I started by adding in blank method(s) within MotorArm, Ruckus Bot and Error404 Autonomous classes. I programmed the shoulder and elbow to go out a random of encoders as I didnt have an arm to work with yet..

Mark: Over the week I was able to modify the current collector to run off of the vex chain and sprockets. We also discovered that the best way to collect is to use a sticky tubing in a loop attached to the axle to pull the minerals in.

Date: Sat, 1/16/19**Location:** Belbas House**Purpose:** Programming subgroup**Attendees:** Andrew, Ben**Agenda:**

- Programming the Arm for autonomous

Reflections:

Programming (Andrew, Ben): We worked on programming the arm to knock off the gold mineral in autonomous after tensorflow. We programmed the 3 different ways that the robot had to turn after tensorflow had detected the gold mineral and then extend the arm 3 different lengths (left, right, center) in order to successfully hit the mineral.

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Date: Mon, 1/18/19**Location:** Belbas House**Purpose:** Team Meeting #34**Attendees:** Andrew, Ben, Mark, Zach, Mariah, Joel, Luke**Agenda:**

- Driver Practice
- Autonomous work
- Work on Arm

Reflections:

Programming (Andrew, Ben): For the programming team Friday was a 13-hour meeting. We started in the morning with driving practice. Andrew is the backup chassis driver and Ben is the backup arm driver. Since Mark won't be able to make tomorrow's meet, Andrew and Zach will be driving during the matches. After driving practice, we settled in for autonomous work. We had the logic in for finding and turning towards the gold mineral, but everything after that needed to be done. We worked on making arm methods that extend and retract the arm and coded in a home-preset that brought the arm in at the press of a button. We used the arm to knock off the gold mineral. About 8p, the navx gyro in the robot died and since the gyro is the keystone to our autonomous, without a gyro we don't have an autonomous. We hurriedly switched over to using the internal IMU gyro in the REV hubs. It's not as accurate as the navx, but we made it work. One of the way we helped reduce navigation error with the new gyro was to square the robot up on the field walls during autonomous. Wall riding is something used a lot in FLL and it works just fine with FTC bots too. After addressing the gyro problem and breaking and then fixing the elbow joint, we finally got an autonomous on the depo side that removes the gold mineral, deposits the marker in the depo and parks in the crater with the arm extended for teleop.

- Mechanical (Luke, Mariah, Joel): Today we were doing repairs on the arm as it had been previously broken. This was a difficult task because it required the robot to be put at a strange angle. To do this we needed four people to hold and stabilize the robot in four separate places.

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Date: Mon, 1/21/19**Location:** Belbas House**Purpose:** Team Meeting #35**Attendees:** Andrew, Ben, Mark, Zach, Joel,**Agenda:**

- Work on collector
- Assemble and test winch

Reflections:

Mechanical (Joel, Zach) Today we worked on the winch assembly. The mechanism was completely assembled and tested for the first time today and it worked nicely. Once assembled, we attached it to the first generation robot and found that the winch had no trouble lifting the robot. The robot also stabilized itself with the small corrugated plastic walls on each side. Whenever we ran the winch without a load, it sounded like it was grinding; however, under load it seemed to work fine. We only had one spare REV axle hub, so the spool only had that on one side secured to the axle. Although the single piece offered enough strength, we will definitely use two in the future. We did find one problem, whenever hanging, our robot extended past the borderline. This could interfere with other robots and cause penalties later.

If we modify the tape extender so that the tape comes out at an angle, it might help us keep to our side. So, this change was made to the CAD by moving the slit that the tape extends from to a lower height. Additionally, a small clear piece was designed in CAD to cover the open side of the drum to keep out dust and keep the tape from sliding out. A photo of the updated assembly is shown below.

Mark: Since the beginning of the season we have wanted to incorporate into the collector a way of controlling each side separately. Over the weekend I made the necessary changes in CAD and the new collector box was printed before today's meeting. I started the assembly, but we need several parts to finish it mainly four sprockets to drive the intake.