



BROWNCOATS

Team 7842 Engineering Notebook - Rover Ruckus

Date	Location	Start Time	End Time	Week #
November 2, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	9
Meeting Goals: Printed out photos of Vera for display boards, practiced speeches for judging				
Team Members in Attendance:				
Megan, Ian, Kye, Jalynn, Joel				

Tasks	Reflections
Robot Hardware - Lift	<p>Ian: Today we finished attaching the hang lift to the robot. We determined that the lift needed more support near the top, so we braced it with two diagonal beams, as well as two vertical ones. This creates a very rigid triangle with the lift as one of the legs, which provides sufficient rigidity to hang. Once the lift was securely mounted to the drive train, we proceeded to test the capabilities of the lift. The two motors are more than capable of lifting the robot. However, since the lift is recessed from the edge of the robot, the rear section of the drive train gets caught on the lander as the lift is retracted. A proposed solution to this problem is to use thin metal strips, bent to the required profile, to act as “guides” for the back of the robot to follow. This should allow the robot to smoothly lift up and descend from the lander. Additionally, we began rewiring the robot today. The current configuration has the electronics mounted in the middle of the robot, low to the ground. Such a setup provides easy access to the electronics, and a more accurate position for the integrated Inertial Measurement Unit (IMU). Horizontally and near the center of rotation is the ideal spot for an IMU, which this setup allows.</p>
Engineering Notebook - Meeting entries	<p>Jalynn: During today’s meeting, I continued to make and update meeting entries. I completely finished all of the September entries and all of the October meetings are made, but are waiting on more team entries. Once I finished, Ms. Cindy gave me the task of combining all of the outreach entries in a separate document. Combining all the entries on the same document would make it easier and faster to print them out when it was time. I started to combine them, but shortly afterwards I noticed that the page numbers were in the wrong order! I told Ms. Cindy and we tried to fix it, but eventually decided to fix it another time. By that point, Kye finished editing photos and we finished adding meeting photos to the entries.</p>

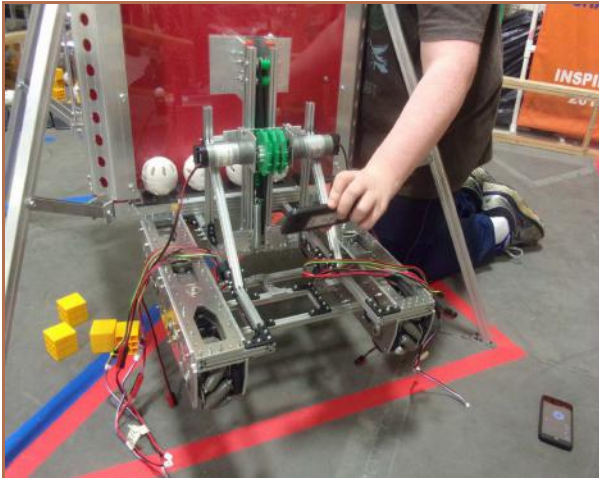


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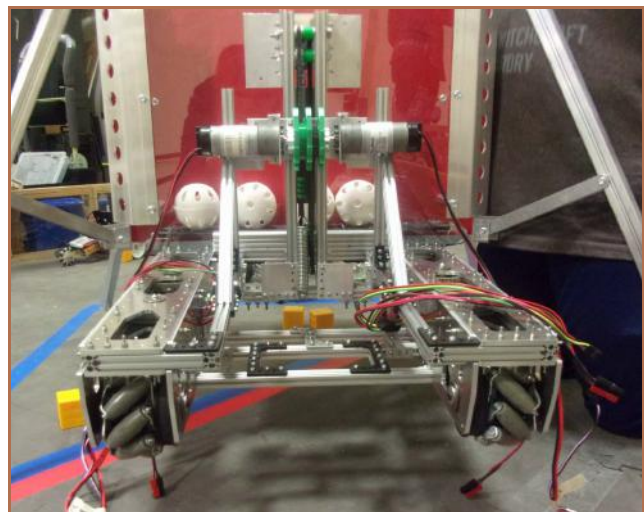
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Judging

Megan: On Friday November 2nd, the team went through our judging presentation multiple times. One thing I noticed was that almost everyone was having trouble with projecting as they spoke, and because I've participated in theater for most of my life, I had picked up many projection exercises over the years, so I taught one of the exercises to everyone and had them do it a few times. I would have them say their introduction for their presentation over and over again, and each time they did, I would take a few steps back, and by the time it was finished, I would be halfway across the room, and without realizing it, they started speaking up so I could hear them.



Our robot, Vera, hanging from the lander





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Date	Location	Start Time	End Time	Week #
November 3, 2018	AvaLAN Wireless	12:00 p.m.	5:00 p.m.	9
Meeting Goals: Worked on the robot (getting it ready for Arkansas), Re-pinned the picture boards, Got ready for Nerdcon				
Team Members in Attendance:				
Kye, Ian, Brooklynn				

Tasks	Reflections
Robot Software - Autonomous	<p>Ian: We began this meeting by finishing up the wiring from last meeting. This allowed me to quickly start on autonomous work. However, as I worked on tuning software, the aforementioned unexpected behavior arose, even with changed controller gains and constants. I also noticed odd behavior in TeleOp when trying to drive. Seeing this, we began trouble shooting what might be the cause. First, we set the robot on its side and ran the motors at varying speeds. The left drive motors seemed to be rotating significantly faster than their right counterparts, even when the applied speed was extremely low. To try and determine the cause of the issue, we plugged a different motor into one of the left motor ports, and plugged the same encoder cable into the motor. The behavior still occurred, which ruled out the motors as causes for the problems. Next, we tried swapping out each cable individually, both power and encoder. Finally, we reached the encoder level shifter. The level shifter converts the 5v logic of the Neverest encoders to the 3.3v logic of the REV hubs. We swapped out the level shifter, and the behavior disappeared. Thus, we concluded that the left level shifters were bad, and we replaced both of them.</p>

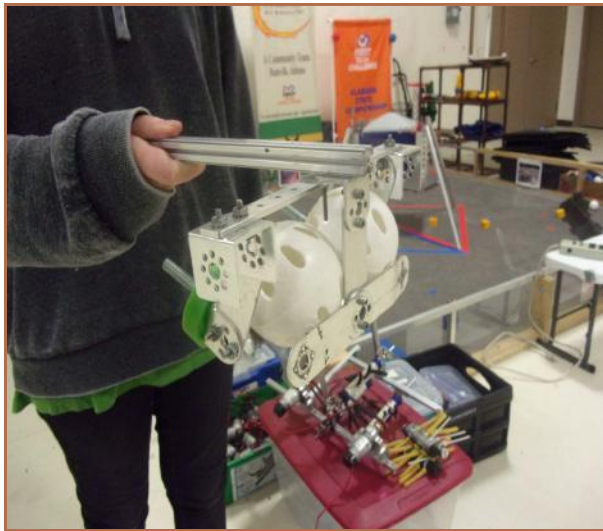


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Robot Hardware - Intake/Collector

Brooklynn: Today, I started to work on my claw intake prototype. I started off by scavenging through the Tetrix parts for things that I could use for my intake. But I first needed to know how wide it would need to be so I took two balls, put them next to each other on the floor and placed them on top of flat metal pieces for size. Once that was done, I took a long Tetrix piece and put two servo mounts the width apart to fit two balls. Next thing to do was to put a back on it so I used 2 long flat pieces and a corner-like piece on it. I put them together in the shape of a “T” with the corner-like piece on the bottom of the “T”. Then flipped it upside down and attached it to the back of my intake. Last was the arms that would be attached to the servos but what was small, sort of sticky and squishy. The object that fit what I needed was the green squishy wheels, so I grabbed two small wheels, two of the long flat pieces, and two corner pieces. Then, I assembled them together, attached them to the servos, and then attached the servos on the servo mount. Tested it out and saw that it needed some more support from the back to help grab the elements. So I wrapped the back with soft rubber shelf liner, hoping that it would help, and it did.



Brooklynn's claw prototype



Ian working on autonomous programming outside (where the wi-fi is better) with a little help from Mr. Jeff!



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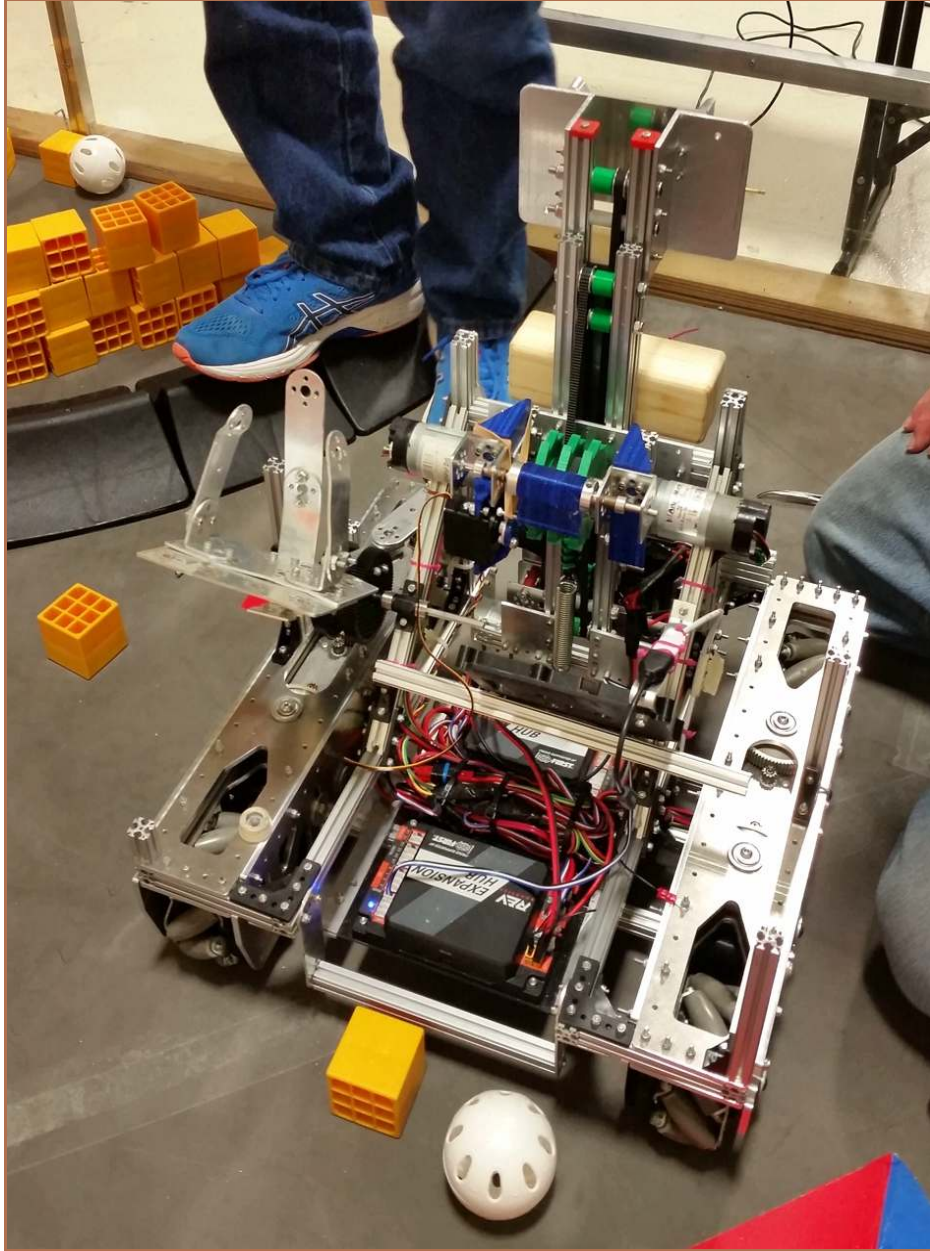
Date	Location	Start Time	End Time	Week #
November 4, 2018	AvaLAN Wireless	11:00 p.m.	4:00 p.m.	9
Meeting Goals: Continue working on autonomous				
Team Members in Attendance:				
Ian				

Tasks	Reflections
Robot Software - Autonomous	<p>Ian: With the level shifters fixed and the unexpected behavior resolved, I started to work on autonomous again. I made significant progress with the depot corner routes, and sampling was working consistently. Driving to the depot and parking in the crater still need to be tuned, however. Unfortunately, during my testing, the hanging lift partially disassembled itself. The internal plastic sliders in the linear slides are retained by two screws. These screws never had threadlocker applied to them, which allowed them to loosen and fall out of the extrusion slots. This allowed the sliders to move freely, and caused one of them to work itself out of the slot. It's rather fortunate that this happened now, and not at a competition, however. With the hanging lift no longer functional, I stopped autonomous testing and began repairs. The lift had to be completely removed from the robot structure. Thankfully, we did not have to unspool the belts, which would have been a significantly more complex job. We made diagrams and took pictures of the assembly before sliding the two stages apart, and began refastening the sliders. This time, we applied threadlocker to each screw, and tightened them down snugly. This should prevent this from happening in the future. After the disassembly, we slid the stages back together and refastened the lift into the robot structure. I then resumed autonomous testing, and tuned the parking and depot segments. I'm still not entirely pleased with the parking segment. There's some inconsistency in it, and the robot isn't turning quite enough regardless.</p>



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Date	Location	Start Time	End Time	Week #
November 8, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	10
Meeting Goals: Finish autonomous, practice judging, pack for Springdale, AR qualifier				
Team Members in Attendance:				
Ian, Megan, Brooklynn, Joel				

Tasks	Reflections
Robot Software - Autonomous	<p>Ian: I spent the day buttoning up autonomous as much as I could before our competition. I spent most of my time attempting to make the parking segment more consistent. While improved, there is still a little bit of inconsistency. I think this is due to sensor localization error stacking up over the run, which results in something significant by the end. Unfortunately, I couldn't do much to combat this before our competition.</p>
Competition Preparation - Judging Practice - Supply Gathering	<p>Brooklynn: Those who were going to the qualifier came back to AvaLAN to make sure we had everything and to practice judging to make sure we had it down for when it's time for the Arkansas qualifier.</p> <p>Megan: On Thursday November 8th, the day before we went to Arkansas for our first qualifier, the team got together to pack up all of our stuff, and to run through our judging presentations multiple times, so we could all be comfortable with it and so we could do our best on Saturday. Each time we practiced, we got a little better, and by the end of the day, we all felt ready for the real deal.</p> <p>Joel: I helped pack things up for the Arkansas qualifier, and we all practiced our judging speech.</p>



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Judging Practice



Our robot, Vera at the point of the Springdale qualifier



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Date	Location	Start Time	End Time	Week #
November 10, 2018	Springdale, Arkansas	7:00 a.m.	6:00 p.m.	10
Meeting Goals: Springdale, Arkansas Qualifier				
Team Members in Attendance:				
Megan, Ian, Joel, Kye, Brooklynn				
Tasks	Reflections			
Overview -Highlights of event	Megan & Kye: On November 10 th , we attended our first competition of the season, which was a qualifier in Springdale, Arkansas. We had an amazing day, where we met lots of other FIRST Tech Challenge teams, and we got to see many different designs, and a lot of strategies on how to go about scoring in each match. Everyone was so nice and inclusive, and we made many friends! The competition was rather successful as well! The matches started after lunch; we won all 5 qualifier matches. After picking an alliance partner, we also won the first two matches of the semifinals. We then moved on to the finals; we had to win 2 out of the 3 matches. We lost the first match, but we won the next two. At the end of the day, we set a few high scores for the qualifier, and ended up winning first place in competition as the winning alliance captain! We're so happy with how we did, and we had an awesome time! We couldn't have done it without our alliance partner, team 7172 Technical Difficulties! We learned a lot during the competition, including some things we could improve on, and some things we did well, and plan to do again. It was so much fun, and it was such a great learning experience. We're looking forward to the next qualifier!			
Observation	Joel: I helped answer questions at the booth at the Arkansas qualifier. I also saw many impressive intakes and robots that we studied.			



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<p>Detailed Summary</p> <ul style="list-style-type: none"> - Sequence of competition day 	<p>Brooklynn: The night before, we dropped some stuff at our table so we didn't have to bring it tomorrow and set up our displays. Then the day of the qualifier when everybody arrived, we signed in and checked the robot to make sure everything was in order. Next we went to get the robot checked out to see if it obeyed all of the constraints set for the challenge by the volunteers. Once that was done, it was the waiting game for judging and we practiced a bit to try and make us less nervous about it. Afterwards everyone was less uptight and more relaxed because all that was left was for the matches to happen. The five matches that we were in were: Match 1 on the blue side teamed with Tech Hogs, Match 5 on the blue side teamed with Elementary My Dear Botson, Match 9 on the red side teamed with Terminators, Match 14 on the red side team with Solid Rock, and Match 21 on the red side team with GSA Cardinals. We won every match with over 100 points each time and we were first overall! Practically everybody was jumping up and down because we were advancing!</p>
<p>Competition Details</p> <ul style="list-style-type: none"> - Inspecting - Judging - Overall Robot Operation 	<p>Ian: The competition began with inspection, which ran quite smoothly. Vera slipped easily into the sizing cube, and weighed in at 34lbs. This is a little concerning for future additions, but that's a problem to be dealt with later. We then moved to the practice fields to tune autonomous before judging. The practice area had a few uncovered windows, which allowed sunlight to shine across sections of the practice field. This threw off the results of the vision detector, which concerned me greatly. Fortunately, the lighting over the competition field was very similar to that of our practice space lighting, meaning that the detector behaved similarly. The parking segment was tuned some more to attempt to perfect it. While still better, it's not quite where I would've liked it. While practicing hanging the robot, I drove the lift too far into an endpoint. This caused the belt to slip out of the clamp, and the robot fell to the floor. Luckily, all that had to be done to fix this was to snip the zip ties on the clamp, reclamp the belt, and then fasten new zip ties. After we resolved this issue, it was time for judging.</p> <p>Judging went very well, and I felt very happy with how we presented. Next was the match schedule, and qualification matches shortly after.</p>



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Competition Details

- Inspecting
 - Judging
 - Overall Robot Operation
- (continued)

Ian: We went undefeated in qualification matches, placing us in 1st! The vision detector worked every single match, but the parking segment caused the robot to descord the sampling field once or twice. There's a few possible solutions to this, which will be explored after the competition. We invited 7172 Technical Difficulties from Texas to join our alliance, because we felt that our autonomous and their ability to score in the lander during teleop would be the best pairing. We went 2-0 in the semi-finals, and went 2-1 in the finals. This marked the Browncoats' first Winning Alliance Captain in the history of the team. Additionally, the vision detector worked every match, but we descorded the sampling field once in the Finals, due to the parking segment. I am still concerned about the vision detector in varying lighting conditions, and I plan to do research into industrial solutions to this problem. We also won the design award! Overall, I'm very happy with how we performed at this competition, especially considering how early in the season it was.



With our alliance partners, 7172 Technical Difficulties



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Awards Ceremony



We went for ice cream afterwards to celebrate!



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Date	Location	Start Time	End Time	Week #
November 16, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	11
Meeting Goals: Discussed needed improvements, Reviewed competition videos				
Team Members in Attendance:				
Kye, Jalynn, Ian, Megan, Brooklynn, Joel				

Tasks	Reflections
Competition Discussion	<p>Megan: The team sat down to discuss our experience at the Springdale, Arkansas qualifier. First, we discussed some of the things we did right. We all agreed that our strategy worked incredibly well: complete everything in autonomous, score in the depot during tele-op, and hang during end game. But, we also agreed that this strategy probably wouldn't work again at any of the other competitions, as more people would be adding scoring arms to score in the cargo hold, so we decided that our next step would be to build an arm and an intake/scoring mechanism for our next competition, and possibly have it ready by the scrimmage we're co-hosting on December 15th. The autonomous software worked almost every single time, though we came to the conclusion that use of sensors could make it more consistent. Our goal with autonomous is to be able to score everything on the crater side, not just on the depot side, which is what we did in every match during the qualifier. Our plan is to have this all completed by our January qualifier.</p> <p>All in all, it was an amazing experience for us, and we couldn't be happier with how it all turned out.</p>
Competition Discussion	<p>Brooklynn & Jalynn: Today's meeting was mostly dedicated to talking about last week's qualifier in Arkansas and what we learned from the experience. We discussed what should be improved on or added to the robot, as well as what we did right for this year's robot. Finally, we discussed what we had to work on ourselves for the next qualifier in January.</p>



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<p>Competition Discussion - Wanted Improvements</p>	<p>Ian: Most of the day was spent reflecting on the Springdale qualifier, and lessons learned from it. Additionally, the team discussed plans for the future. After some discussion, we agreed that we didn't want to disassemble the current hanging lift, even if it meant we would have to change our original game strategy (involving two separate lifts, a vertical and a horizontal one.). After evaluating our options, we decided that a single actuating lift (with the capability to go from slightly below horizontal to completely vertical, at the very least) would be the easiest to integrate into our weight and space constraints. We currently aren't sure what the best gear ratio from the motor would be to rotate this arm, but 90-100 degrees per second seems like a good target to shoot for.</p>
<p>Competition Discussion</p>	<p>Joel: We watched videos from the Arkansas qualifier, and we learned new strategies to play at competitions. We also looked at ways to improve our robot and also what kind of intake to build.</p>

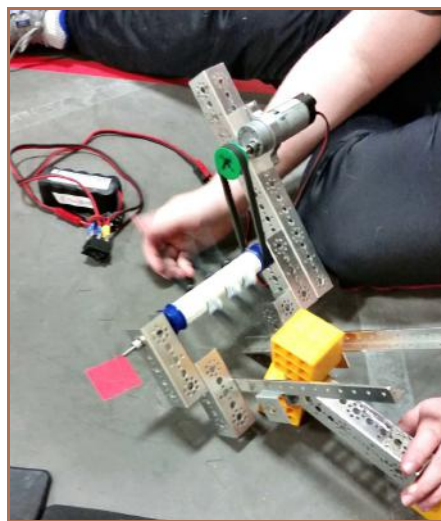




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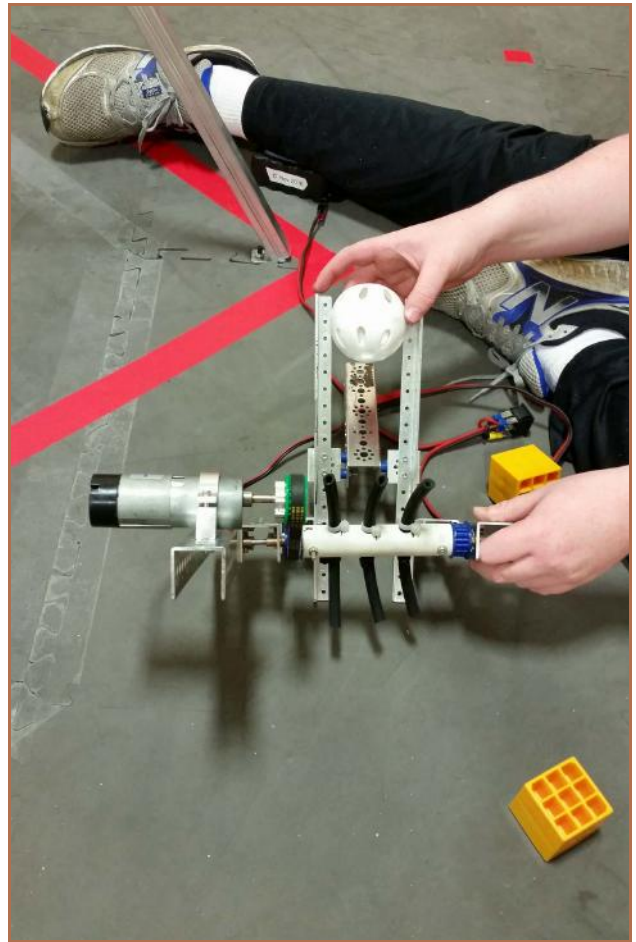
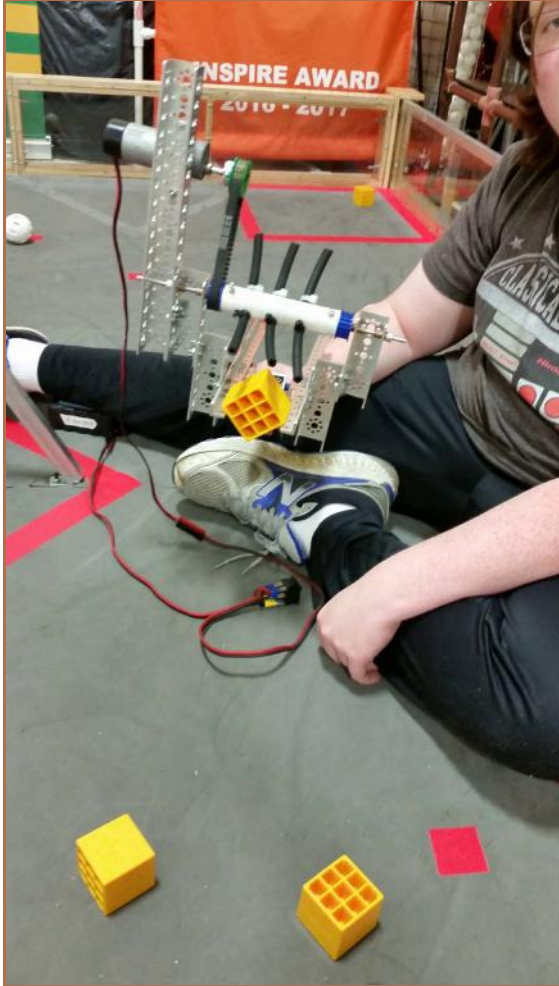
Date	Location	Start Time	End Time	Week #
November 20, 2018	AvaLAN Wireless	1:00 p.m.	5:00 p.m.	11
Meeting Goals: Testing intake concepts				
Team Members in Attendance:				
Ian				
Tasks	Reflections			
Robot Hardware - Intake/Collector	<p>Ian: Today I tested an intake concept, based on a similar concept that I've designed in Solidworks. The idea is to filter cubes out of the hopper by having "rails" for the balls to roll up, whereas cubes will go through the gap in the rails. This takes advantage of the constant diameter of a sphere, which results in more reliable rolling. I used an intake roller made of stiffer 0.5" OD neoprene tubing powered by a neverest 40:1 for this concept. This was the closest I could easily get to represent the speed of a VEX 393 motor, which is what we plan to use for the intake. This is because they count towards the 12 servo limit, and not the 8 motor limit (and they're lighter than a motor). However, they have significantly less output power than a motor, so stalling may be an issue. Regardless, the concept seemed solid enough to continue pursuing.</p>			





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Date	Location	Start Time	End Time	Week #
November 30, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	13
Meeting Goals: Testing single actuating arm, Set up Pit				
Team Members in Attendance:				
Ian, Joel, Kye, Jalynn				

Tasks	Reflections
Robot Hardware - Intake/Collector	Ian: A significant portion of the day was spent testing various things related to scoring. Primarily, different ratios were tested for a single actuating arm to balance speed and capability to lift while loaded. After changing motors out and swapping pulleys for different diameters to mix and match ratios, we decided on roughly 360:1 as a good “sweet-spot” ratio for the actuator. We tested with a 48” arm loaded with a 3lb weight on the end, and the speed was more than acceptable. It seems like a promising ratio for an actual arm.
Engineering Notebook - Meeting Entries - Editing	Jalynn: Today I mostly worked on updating any meeting entries that needed it, and I also did some editing on the outreach entries. We also set up our Pit to make sure the new banner would fit.



Our new pit design



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Jalynn trying out the single-arm concept



Ian testing the weight capabilities of the single arm concept