Engineering Notebook

FTC 7347

March 24, 2015

Matt Iverson
2014-09-16
Brainstorming

This week, I calculated the space we'd need for a scissor lift / conveyor belt mechanism.	The mechanism will fit and reach high enough, but it'll take up a lot of space.

I measured our team's conveyor belt to be 2.5 inches thick. Our robot can be up to 18 inches tall, so we can fit up to 7 layers of the conveyor belt on our robot. We'll need about 2.5 inches on each side of the conveyor belt for tubing to move balls between belt layers, so the belt can be up to 13 inches long. 13 inches at a 45 degree angle is approximately 9.2 inches up and to the side, meaning our scissor lift could reach up to 64 inches (163 cm). This is well above the top of the center goal (120 cm), but I think the system will likely collapse under its own weight at that height.

Ben Trout
2014-09-19
Brainstorming, Designing, and Promoting FTC

Brainstorming	We started our brainstorming by making three subsystems for scoring blocks: Intake, Lifter, and Scorer. We had a bunch of designs down and ideas flowing. As a team we we're able to list pros and cons of all the designs mentioned and narrowed it down to just a few quality designs.
Designing	Once we had our ideas pinpointed that we thought would be best for accomplishing the challenge we started to design different components of the robot. Nick, Alex, and I mainly focused on the intake method of picking up balls.
Promoting FTC and FIRST	I went to a lego robotics meeting with my FRC team for recruiting Lego Robotics coaches for the FLL league at liberty that we're starting up. We wanted to promote all three levels of FIRST. We had old lego robots for demo, I brought a ball shooting FTC robot I built and my FRC team brought their worlds robot from last year. We demoed all the robots and got the kids exited for robotics, hopefully they will move up in the FIRST levels and be on the Liberty FTC team in the future.

Brainstorming

Ways to play the game:

- Tip rolling goal onto ramp. Shuttle balls up and down ramp
- Grab rolling goal and drive around with it putting balls in
- Put balls into center goal

Subsytems:

- Intake
  - scooper

- rotating brush
- suction
- rotating wheels

- Lifter

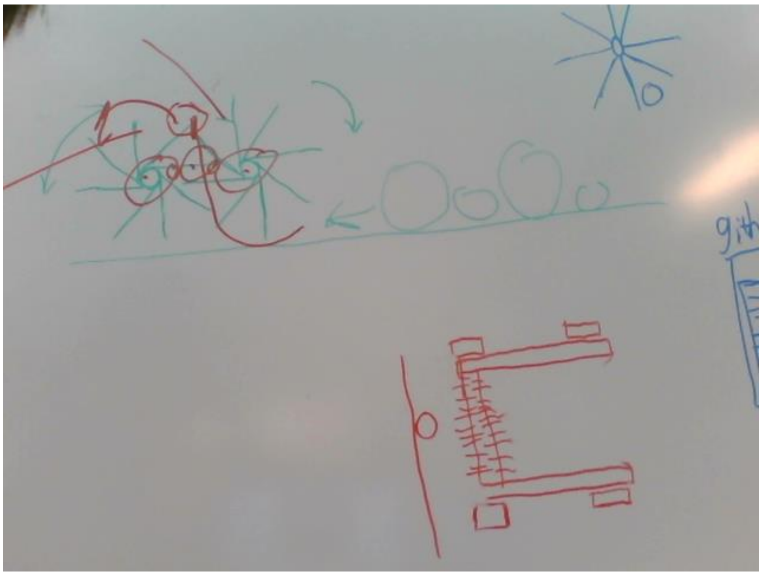
Subsystems:

- Intake
  - scooper
  - rotating brush
  - conveyor belt
  - suction
  - rotating wheels
- Lifter
  - batched
  - continuous feed
- Scorer
  - active dumper
  - passive dumper
- Goal attachment
  - claw
- Drive base

Lifter/Scorer:
Trio of Archimedes Screw
Conveyer belt Tri belt Pulley system
Guided launcher mechanism
Ball sorter
Scissor lift with conveyer belt to bring balls up
Spring Shot with guided tube
Pulley system
surgical tubing sling shot with guided tube

Designing

As a team we decided to use rotating brushes to intake the balls, a surgical tubing sling shot with a guided tube into the goals, and a passive dumper. Our main idea for scoring is using claws to attach to the base of the goal and carry it around with as we launch balls up a tube and deflect them into the goal. We have rotating brushes that intake the balls into a slingshot that launches the balls into a guided tube that is extended and retracted by a pulley system. The only part of our brainstorming that we have designed is our intake:



The balls flow under our robot where one rotating brush brushes up a wall bring the balls up into the robot and deflected onto a ramp that leads the balls into the slingshot. The odds of surpassing the five ball limit is low so we aren't going to incorporate a sensor yet. We did a lot of calculations like how many balls we'll pick up per second, size of balls, and if different ideas like a scissor lift will fit in our Robot. I wasn't in charge of calculating, but other team members like David and Matt were.

Promoting FIRST

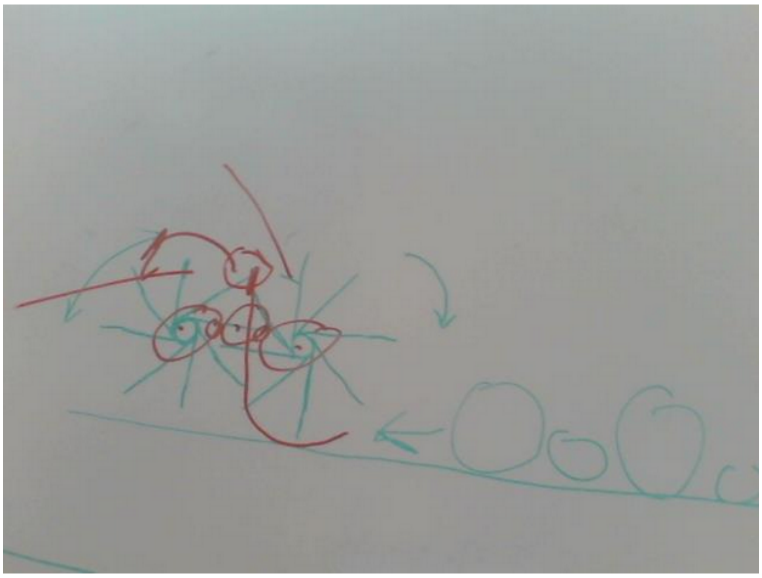
At the meeting put on by my FRC team our main goal was to get Lego Robotics coaches for the starting lego robotics program at Liberty. We want to get young students excited for robotics and mainly LEGO Robotics. But we don't want these kids to stop doing robotics after FLL. We want to start their robotics program early and keep them going through the levels of FIRST so that when they get to FRC they are used to robotics. The FRC team brought their robot and demoed it and I brought a small FTC robot I made to demo for the kids. We had all three levels of FIRST robots present to get the kids and parents excited for robotics.

Nick Vosseteig
2014-09-17
Brainstorming, Designing, and Promoting FTC

This week, the team and I worked together to brainstorm possible ideas for the intake device, the lifter, and the scorer. We also did some calculations and strategic planning.	Overall, it went very well. We successfully came up with a design for the intake device and plan to begin building it next week. We have some possible designs for the lifter and scorer as well, but we are not completely decided and plan to do some tests and calculations to determine what the best method will be.

The main challenge with the brainstorming is trying to lift two different sized balls the maximum of 120 centimeters. It's hard to design an intake device that can pick up both the small and large ball. We also determined that it is most efficient to just pick up all the balls and put them randomly into the tubes instead of trying to get one small, then one large, as this is too challenging and not worth trying to build something to sort the balls and add them to the tube separately. The next problem was not picking up too many balls at once, which we have still not found a definite solution for. We are considering using sensors, but we don't have this incorporated into the design yet.

Here is a picture of the mechanism that we plan to build next week:



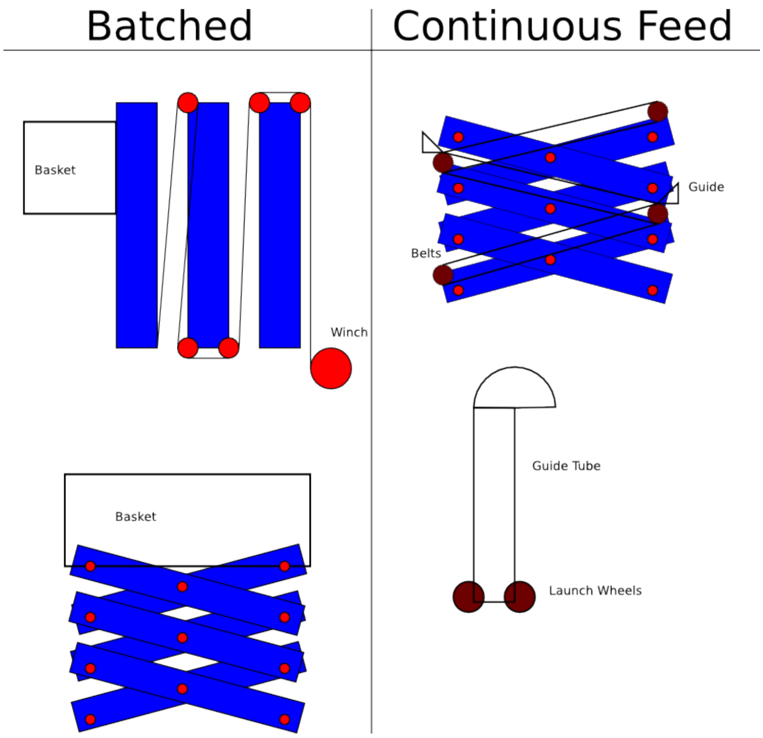
The spinners represent brushes, but we are going to build the device with only one brush and test if it will work that way. The one-brush design will only use the front brush and have something to shove the ball up against (represented by the red line in between the two brushes).

Alex Iverson
2014-09-22
Strategizing and Brainstorming

I worked on identifying ways to play the game.	I think we were fairly thorough. I do not anticipate seeing any major strategy elements at the tournaments we have not anticipated. I do, however, expect to encounter a combination or variation that we have not considered.
I helped brainstorm types of players we could build.	I would have liked to have come up with more possibilities, but I can not think of anything to add. However, it is taking a long time to analyze the ideas we have because some of the team members need to be trained how to do so; Having too many more ideas may take too much time.

The first thing we did was try to identify what interactions with the field elements were involved in playing the game. Then we looked at how these interactions could be combined into strategies.

The first major challenge was to organize the brainstorming. Because I have more experience with designing for the FIRST competitions, I led the effort. I had difficulty conveying the distinctions between subsystems and mechanisms for the purposes of strategizing. Subsystems are categories for how the robots can interact with the field and gameplay elements, for example, a batched scorer versus a continuous feed scorer, or a rolling goal pusher versus a rolling goal grappler. They are relevant to strategy because those distinctions affect what the robots are able to do on the field. A mechanism is an implementation of a subsystem, and is largely irrelevant to strategy, because how a robot plays is much more dependent on what it can do rather than how it does it, for example, whether the robot uses a scissor lift or a forklift style pulley system to lift the balls is not important because as they are both batched scoring systems they are subject to very similar performance and limitations.



We tried to estimate the performance of various subsystems to determine the effectiveness of the strategies. A batched lifter and scorer system is limited because it needs to be in a down position while collecting balls and a raised position while scoring, so its scoring rate is reduced by its travel time. A continuous feed lifter and scorer system, on the other hand is limited by needing to have a goal on hand and its requirement to handle balls in single file (this is a simplifying approximation that we assume will be proven wrong at some point.). We computed the average density of the balls based on the assumption that they would be uniformly scattered across the field area. That density allowed us to estimate the rate at which an intake of a given width would encounter balls. These calculations allowed us to estimate the scoring potentials and limiting factors of each potential design, so that we can make an informed decision about what type of robot we want to build.

Matt Iverson
2014-09-23
Brainstorming

We made decisions about which prototype to use.	We've come up with pros and cons, but haven't made a whole lot of progress yet.

We have 2 different designs for both types of scorer we came up with, batched and continuous. Alex made a document containing sketches for all the designs, and Ben made a list of pros and cons. I think that the best way to score the balls is with a continuous scorer, but that requires a lot of power and needs to quickly sort the 2 different sizes of balls.

Ben Trout
2014-09-24
Brainstorming, Calculating

Brainstorming	We established our intake last week so we went over our lifter/scorers and went over what path we want to pursue using pros and cons of all the ideas the team had.
Calculating	We started by doing a bunch of calculations to see if it is even possible to launch a ball to the correct height. Alex is in charge of the calculations but Filip and I helped him with measurements. See Alex's notebook for the calculations.

Brainstorming

As a team we went through all the pros and cons of our four lifter/scorers: **Batched:**

Pros: possible, easy, reliable, simpler Cons: unreliable

Continuous Feed: Pros: faster than batched Cons: unreliable

Scissor lift with conveyor belts: Cons: complex mechanically, take up a lot of room, require a lot of power to run, slower than a shot, Gear system to reverse direction of belts: difficult to build

Pros: continuous feed, multiple balls traversing mechanism at once, possible with the parts that we have at hand, store balls along conveyor belt and score balls in end game.

repeating sling shot: Cons: requires large rates of fire, needs to be super reliable, needs to be able to handle a failed shot, wearing out the surgical tubing (loses elasticity over time)

Pros: Faster feed, lower transit times (to not get penalized for carrying more than 5 balls), reliable, easy to build, shoots straight up, more consistent than spring shot, faster reset time than spring shot

Spring shot: Back up plan if slingshot fails

Belt variant: Cons: very slow (but not as slow as scissor lift) balls could fall off easily, hard to build, unreliable

Pros: see pros of scissor lift

Guide tube with pulley system: hard to build a telescoping tube, manufacture the plastic tubing very precisely. and integrate pulley system.

Best Idea: Sling shot

We are going to split our group into two teams: One to prototype the intake system and one to prototype the sling shot. We are going to design them first and get a bill of materials.

We split of into two groups for the two prototypes: Intake: Mat, David, Alex Slingshot: Ben, Filip, Nick

Math

Nick, Filip, and I helped Alex calculate whether or not we can actually launch the balls 120cm with the surgical tubing we have. See Alex's enginering notebook for all math calculations.

Filip Lewulis
2014-09-24
Research and Calculations

Intake calculations	Matt and David looked over the ideal geometry for the intake device to the slingshot.
Launch calculations	Alex, Ben and I calculated the power output of the Tetrix DC motors: 10.98W. The masses of the small and large balls are 28.9g and 11.68g, respectively. We then used this data to compute the theoretical maximum rate of fire.

We organized the team into the FTC7347 Github organization. For the launch calculations, Alex introduced us to LATEX format. Today I watched the PTC Robotalk Introduction for an introduction to CREO.

Nick Vosseteig
2014-09-24
Github and sick

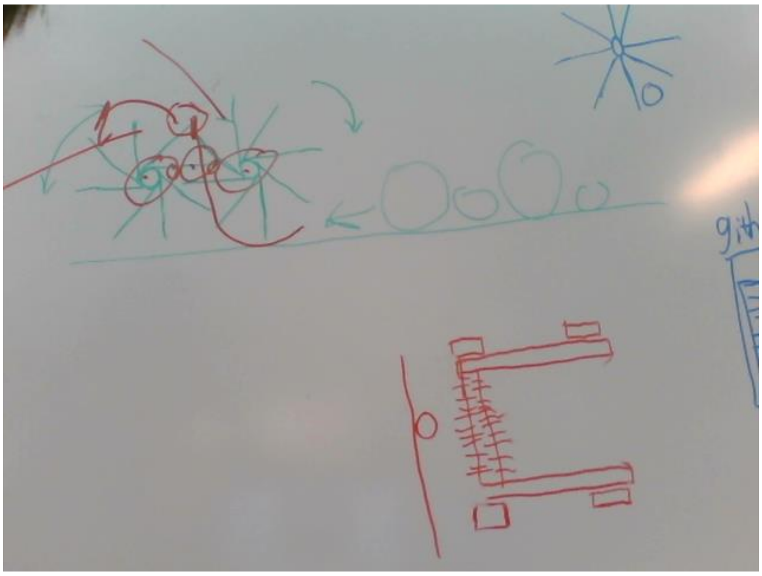
Github	Unfortunately I was home sick for most of the classtime this weeks and was unable to get much done because of this. However, I did manage to set up a github account and familiarize myself with the website. The other teammates did this as well.

I wasn't able to do much this week since I was sick for so much of the week, but our team managed to set up github accounts for our team and each individual team member. This will allow us to organize our engineering notebooks and we can work on the same things at the same time more easily.

David Rohrbaugh
2014-09-26
The Intake Mechanism and Git

This week I worked on the intake mechanism, as well as setting up Git on my laptop. I started to calculate the required deflection of the blades of the intake mechanism requires.	The blades will have to deflect a lot, but I do not know how much yet. Finding a suitable material will prove a challenge.

These are two drawings of a proposed intake mechanism.



Alex Iverson
2014-09-29
Designing Mechanisms

Analyzed pros and cons of various mechanisms	Although fairly straight forward, this discussion was also hampered by miscommunications regarding Mechanisms and Subsystems
Began computing requirements for mechanism	This is much slower progress than it should be. Most team members' lack of prior math and physics training means that each calculation has to be accompanied with lessons and explanation

We have decided that the mechanisms we want to attempt to build first are a rotating brush intake and a slingshot based lifter. We have divided up into two teams. I am drifting between them, helping explain what we need to do to design them and figure out what parts we need to order before we go out and buy them. My brother is working on the intake; he needs very little guidance. The lifter team, however, has not yet completed a physics class; given how slowly the design and calculations are progressing right now, I will probably have to switch from showing them how to do the calculations to showing them by doing the calculations. I am confident that once we have designs and materials, the other team members will be much more productive.

Motor load current draw = 0.91A
Motor voltage = 12V
Motor power = 0.91A $\cdot$ 12V = 10.92W
Mass of large ball = 28.9g = 0.0289kg
Density of polycarbonate = $1.22 \frac{\mathrm{g}}{\mathrm{cm}^3}$
Thickness of plastic = 0.125in = 0.3175cm
Diameter of large ball = 2.8in = 7.112cm
Δheight = 120cm = 1.2m

$$\Delta U = mg\Delta h = 0.34\mathrm{J}$$

$$t = \frac{\Delta U}{P} = 0.031\mathrm{s}$$

$$f = \frac{1}{t} = 32\mathrm{Hz}$$

What we are doing now would ideally qualify as prototyping, however, it is being executed far too slowly and ponderously to call it such. The scarcity of materials for our team means that we can't just put together a wood and cardboard mockup to sanity check the ideas. The rest of the team would much rather tinker, and I want to agree, but we do not have all the components required for our ideas on hand, and if we just start buying things without a reasonable idea of what we need then we are likely to run out of money before being able to finish our robot.

Our team name has not been decided yet.

Matt Iverson
9/30/14
Naming Team And Administrative Tasks

This week, we tried to come up with a good team name, and failed.	Hopefully, the current team name isn't final, because I doubt anyone will find it funny. That said, I don't understand it, so maybe it is hilarious in a way I can't appreciate.

The only idea we've had for a name so far is "$(\lambda x.xx)(\lambda x.xx)$", which doesn't make sense to me, but my brother assures me it's a good name. I've never done this before, so I have no idea what a reasonable team name suggestion is. The other thing we did today was discuss the team organization and elect a captain and assistant captain. My brother is the captain, and Ben is the assistant captain. My brother is splitting the team into a few different groups at the start to design the basic parts of the robot.

Filip Lewulis
2014-10-01
Designing

Designing	We considered the lifting mechanisms from looking at last year's FTC competition, but our calculations for intake appear to remain viable. Alex has written the LaTeXfor the maximum rate of fire while introducing us to the syntax. I am following the PTC Robotalk tutorial for using CREO. Ben is researching the materials we can use in accordance with the rules for the robot's components. The launch mechanism is being designed by Matt, David, and Nick. And in accord, our team name is **Children of the Matrix**, which is nice, I guess.

We're all working independently, but next week we plan to reconcile our efforts and begin the actual construction of the robot.

Ben Trout
2014-10-03
LaTeXformating for engineering notebook, Promoting FIRST

LaTeX	We started our engineering notebook on Google Docs, but it didn't take us long to realize that it was very confusing and not organized at all. We switched to LaTeXusing Git as our source control system. TexWorks is the editor that we use.
Promting FIRST	We got six tasks as a group to promote our team to the community and get others to hear about our team. Another main purpose for these six tasks was for obtaining sponsors and others who would want to support our team.

LaTeX

Due to difficulties with Google Docs we, as a team, made the decision to switch to LaTeX. At first I was hesitant as it seemed really hard and inefficient. But after we all learned how to code it, push, and pull the engineering notebook I came to the conclusion that it will be more organized, easy to read, and better to format math.

Promoting FIRST

We have six tasks, one task per person on our team. The six tasks are as follows. Matt is in charge of an essay to get a 3D printer. Filip is in charge of designing on creo a piece we could print using the 3D printer. David is in charge or developing a simple code to move a servo motor to show other people or potential sponsors. Alex is in charge of making a brochure about our team and FIRST to obtain sponsors or to show other people interested in our team or program. Nick is in charge of designing our logo for our team. And finally I am in charge of making a team website to not only promote our team to the greater community, but also promote FIRST. I have a page with example engineering notebooks, a page describing our team, and a page describing our community outreach through out the year. There isn't a whole lot done yet with the website other than the fact that it is created. The website is a build in progress that will be updated throughout the year as we obtain information and do other things.

Here is a link to our website: https://sites.google.com/a/libertycommon.org/children-of-the-matrix/

Nick Vosseteig
2014-10-03
Set up, helping other teams, and finding materials.

Set up	One thing we did this week was set up Miktex and GitHub, and moved over the other engineering notebooks that we had written beforehand into the new system. We now have everything set up and engineering notebooks in the future will be easier to format/create.
Helping other teams	Since there are two other less experienced teams at our school, this week I also helped them set up the programs that they needed to test out some of the things they had built for their robot. Most were unfamiliar with RobotC, so I helped them to write basic programs.
Finding materials	We decided to buy some surgical tubing this week so that we can start building a prototype of the launcher next week.

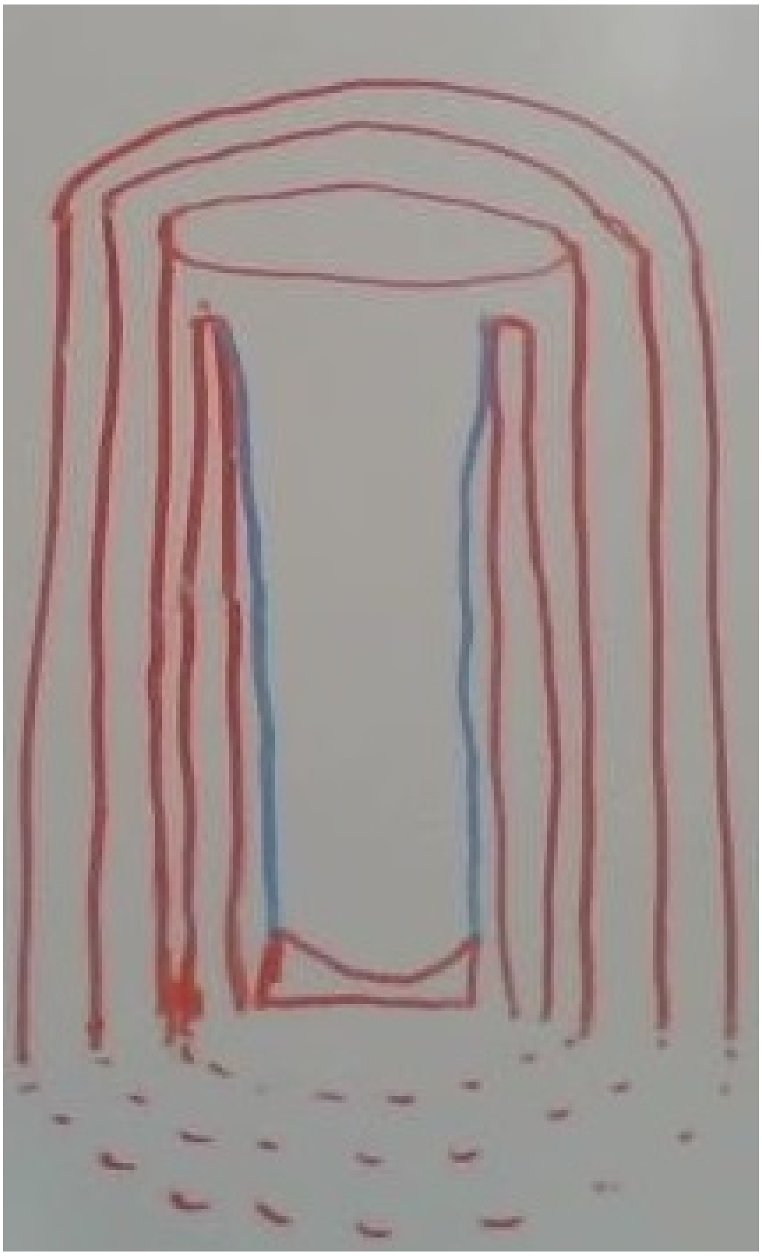
Miktex and Github

This week the main thing we worked on was setting up Miktex and Github so that we can format our engineering notebooks in a more consistent and better format.

Helping other teams

The other thing I did this week was help the other teams program their prototypes for certain parts. This was hard because none of them had any experience with programming previously. I managed to help them write some code that allows them to control the motors on their robot with the Logitech controllers.

The last thing we did was come up with a basic design for the launcher and tube mechanism that we plan to build with the surgical tubing we are going to buy.



Alex Iverson
2014-10-06
Git, LaTeX, Engineering Notebook, and Calculations

Setting up Git	I walked the team through the process of creating Github accounts, installing Git, and configuring it. This was not very smooth, and I still have work to do making sure everyone is able to use these tools well. Ideally we would have done this in the preseason.
Setting up LaTeX	I walked the team through installing MiKTeX. This went relatively smoothly, but there is still a ways to go before everyone is able to use LaTeXand the editing environment well.
Converting the Engineering Notebook.	I created the basic file structure for the Engineering Notebook and began converting the entries into LaTeX.
Calculations for the slingshot scorer	I ran calculations for the theoretical maximum rate of fire that could be achieved based on the motors' power output. The results suggest that the design is plausible, but it is sufficiently close that I will refrain from judgement until we have a demonstrable prototype.

The Git Bash and MiKTeX are now installed on our team's computers. We will be writing our Engineering Notebook in LaTeXbecause it is a better system to write technical documents in than the Google Doc we started with. Git's distributed source control allows us to collaborate more effectively and reduces conflicts from concurrent editing. It will also allow us to maintain source control even when we don't have internet access like at a tournament.

Here are the calculations for the slingshot:
Motor load current draw = 0.91A
Motor voltage = 12V
Motor power = $0.91\text{A} \cdot 12\text{V} = 10.92\text{W}$
Mass of large ball = 28.9g = 0.0289kg
Density of polycarbonate = $1.22\frac{\text{g}}{\text{cm}^3}$
Thickness of plastic = 0.125in = 0.3175cm
Diameter of large ball = 2.8in = 7.112cm
Δheight = 120cm = 1.2m

$$\Delta U = mg\Delta h = 0.34\text{J}$$

$$t = \frac{\Delta U}{P} = 0.031\text{s}$$

$$f = \frac{1}{t} = 32\text{Hz}$$

$$K = \frac{1}{2}mv^2 = 0.34\text{J}$$

$$v = \sqrt{\frac{2K}{m}} = 4.9\frac{\text{m}}{\text{s}}$$

$$m_{\text{plastic}} = (1.5 \cdot 7.112\text{cm})^2 \cdot 0.3175\text{cm} \cdot 1.22\frac{\text{g}}{\text{cm}^3} = 44\text{g}$$

$$K_{\text{plastic}} = \frac{1}{2}m_{\text{plastic}}v^2 = 0.529\text{J}$$

$$K_{\text{total}} = 0.34\text{J} + 0.529\text{J} = 0.869\text{J}$$

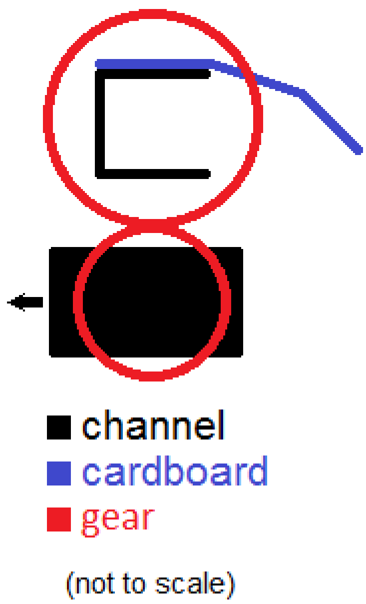
$$t = \frac{K_{\text{total}}}{P} = 0.079\text{s}$$

$$f = \frac{1}{t} = 12.5\text{Hz}$$

David Rohrbaugh
2014-11-07
The Intake Mechanism, Samantha Module, and Electronics

This week, I worked on setting up the router and the flash drives for use with the driver station computer. The router used last year had to be reset and reconfigured. The flash drives also had to be made again. I have not been able to test my work because we are reconfiguring our robot's electronics to incorporate power poles.	All seems to be working properly as far as the Samantha Module is concerned. The robot's electronic parts with power poles incorporated are coming together.

This is a diagram of our current prototype for the intake mechanism. A Tetrix channel is attached to a DC motor so it rotates as shown. It is now geared up. The solid black portion is part of the robot's frame. The robot is facing to the right, with most of it to the left of this representation.



Matt Iverson
2014-10-07
Writing essay for the EKOCYCLE 3D printer application

We calculated the space we'd need for a scissor lift / conveyor belt mechanism.	The mechanism will fit and reach high enough, but it'll take up a lot of space.

I've been writing the essay for the last day and a half. Not exactly what I expected to be doing on a robotics team, but a 3D printer would be extremely useful for us. I'm still working on the first draft; writer's block is setting in like always. This is what the printer looks like:

David Rohrbaugh
2014-10-10
Tasks Related to the 3D Printer and Joystick Control

This week I worked on getting a servo motor working with a joystick. Even though I had the correct code, RobotC was not set up the right way, so it did not work. Nick's computer was set up correctly, so when the code ran on his computer it worked.	I was finished with the task of getting the joystick and servo working by the end of class Thursday. I missed class on Friday, but my teammates continued their work on their tasks. Nick has a lot more code which can be used as a template for doing basic tasks.

Nick Vosseteig
2014-10-10
Brainstorming, Helping other teams, and Testing

Brainstorming	We brainstormed methods to repeatedly fire our slingshot and came up with two possible solutions of a winch with a clutch, and a wheel attached to the ball-holder.
Helping other teams	I continued helping the other teams since they are less experienced with programming. David set up the hardware to test simple programs by using the joystick. This week I also set up a few sample programs that people can reference or test out with the hardware to see how the code works.
Testing	We tested out the surgical tubing by using a makeshift launcher with 2 chairs and a cup attached to the tube in order to test launching the balls. We determined that it does not need to be pulled down very far to launch the balls as high as we need to, but it takes a substantial amount of force to pull down. If we use less tension, it needs to be pulled down further, but takes less force to do it, but having a much shorter, higher tension launcher could increase reliability and make the mechanism easier to work with.

Helping other teams

Helping the other teams with programming is something that I've been working on a lot and this week I came up with some short sample code to show them:

```
#include "JoystickDriver.c"

task main() {
  while(true) {
    getJoystickSettings(joystick);

    if(joy1Btn(1)) {
      servo[servo1] = 255;
```

```
    }
    if(joy1Btn(2)) {
      servo[servo1] = 0;
    }
  }
}
```

It's very simple code, but it helps them to understand how to set up their code and allows them to understand this simple code on how to use a servo motor with the joystick controller.

Testing

We tested out the surgical tubing, but the problem is whether we should use a lot of tension or a little tension. There are pros and cons to both sides: Having less tension means that the tubing needs to be pulled further down, but it would be less hard on the motor doing it, having more tension puts more pressure on the motor, but allows for a more reliable, and more compact slingshot.

Alex Iverson
2014-10-13
Git and Documentation

I continued helping the team learn to use the Git source control system.	Most of the team is getting the hang of the source control system fairly well, but there is still plenty of room to improve.

Most of the team is starting to get to the level where they can use Git and LaTeXon their own, but Nick still requires help resolving merge conflicts, and Ben has trouble remembering the commands.

I made a diagram depicting the functioning of distributed version control on the board and discussed how commiting, branching, and merging work.

Matt Iverson
2014-10-14
Building intake prototype

David and I are getting back to work on the intake prototype, now that our special tasks from last week are done.	We've finalized what we want to build, and have just started building it.

David and I decided that we want to build an intake that uses rotating bristles to pick up balls. The bristles need to be long enough to reach a small ball in the corner, sturdy enough to pull it in, and strong enough to force a large ball out of the corner. So far, we've only built the shaft that the bristles will attach to.

Filip Lewulis
CREO Modeling

Modeling	Our team worked in Parametric to design the ball container. Will helped us a lot.
Robotalk	PTC Webinar Notes:

Our productivity is still slowed by lack of materials.

David Rohrbaugh
2014-10-16
Code for Controlling Robot Remotely

This week I worked on setting up a basic robot. To be more specific, I worked on incorporating the joystick and electronics. We now have basic code for a servo and a DC motor.	We have the basic framework in place, but it will have to be fine-tuned.

Ben Trout
2014-10-17
Cut pieces for Field, Design and Prototype slingshot

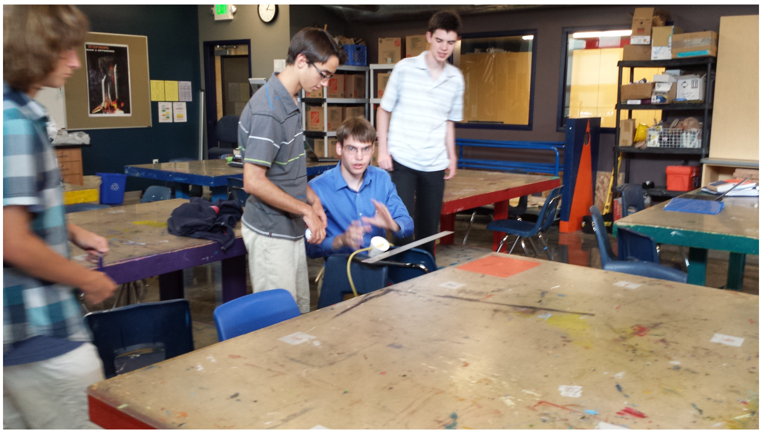
Cut pieces for field	The FRC team I am a part of allowed us to use their wood shop so we could cut the pieces for our field. The first Sunday it was just me and I outlined all the pieces on the two plywood sheets and got started on cutting some of the pieces. I spent a total of three hours the first Sunday with the help of the FRC coaches guiding me, and helping me with the cuts. The second Sunday David and Filip joined me to help cut the rest of the parts. We outlined the rest of the parts on the remaining plywood we had and with the help and guidence of the FRC coach got all our pieces cut. I brought all the pieces to Liberty and now all we have to do is assemble the field elements.
Design and Prototype slingshot	We started to design the slingshot and have a good idea of what it will look like. With the help of Filip and Alex we designed a piece to hold the ball on Creo. My FRC team will help me print the ball holder with the 3D printer they own. Our method of launching the ball is to have a bar connected to our ball holder, and the other end connected to a wheel. The wheel is connected to a motor. As the wheel spins the printed piece will move up and down. As the piece is pulled down the surgical tubing will get pulled down and as the wheel goes around the ball holder will fling up with the surgical tubing flinging the ball into the air.

Field Cutting

The Field assembly went great. I had some adults who know a lot about wood working help me. The planning and cutting went perfectly. We didn't mess up on any pieces and now have all the pieces cut. Now that's all left to do is assemble the field which is up to the other teams with me as there guide.

Designing and Prototyping slingshot

The plan for the sling shot has a lot of potential. We got our surgical tubing and tested different lengths and tightness to see what will launch the ball the required distance. We found though that our testing wasn't very usefull, and wouldn't be until we got our actual ball holder. The holders we were using had the surgical tubing attatched in a different method rather than it would. The actual holder would also be a different mass than our current holder we threw together. We desided to stop our testing on the surgical tubing and launching the balls and instead focus on designing the ball holder on Creo. Next week we'll start designing the holder on creo.



Our team testing the sling shot

The original makeshift ball holder that we made out of TETRIX parts

David Rohrbaugh
2014-10-17
Code for Moving Servo with Joystick

Today, I worked with the rookie team on making a servo work with the joystick. We were not able to get it to work, but this year being my first year coding in RobotC and uncertainty over whether the computer was set up right didn't help.	I and the person I was working with both learned a lot more about using RobotC with joysticks and servos despite failing to move the servo with the joystick.

Nick Vosseteig
2014-10-17
Helping other teams, Testing, Logo design.

Helping other teams	This week I helped other teams by creating some more sample code. I also built a simple model showing how wiring works. It has a servo controller and a dc controller so that I can show the sample programs with it.
Testing	We continued testing the surgical tubing as well as began building a prototype for the intake device.
Logo design	I made a logo for our team this week.

Helping other teams

This week I created another sample program that uses the Logitech controller to control the motors.

```
#include "JoystickDriver.c"

task main() {
  while(true) {
    //each stick controls a motor
    getJoystickSettings(joystick);

    if(joystick.joy1_y1 < 20 && joystick.joy1_y1>-20) {
      motor[dc1] = 0;
    } else {
      motor[dc1] = joystick.joy1_y1;
    }
  }
}
```

The code shows people how to move the motors using the joystick, demonstrates using a deadzone for the joystick, and shows them how to use DC motors.

Logo Design

I created a logo for our team - Children of the Matrix. The logo has a brain, with one half being organic and the other half looking like part of a computer. Children of the Matrix means people who can connect to the internet with their minds, so I found the brain with two sections fitting. I also added in the two prominent letters from our name into the brain: C on the organic side of the brain and M on the technological side. Here is a picture of the logo:

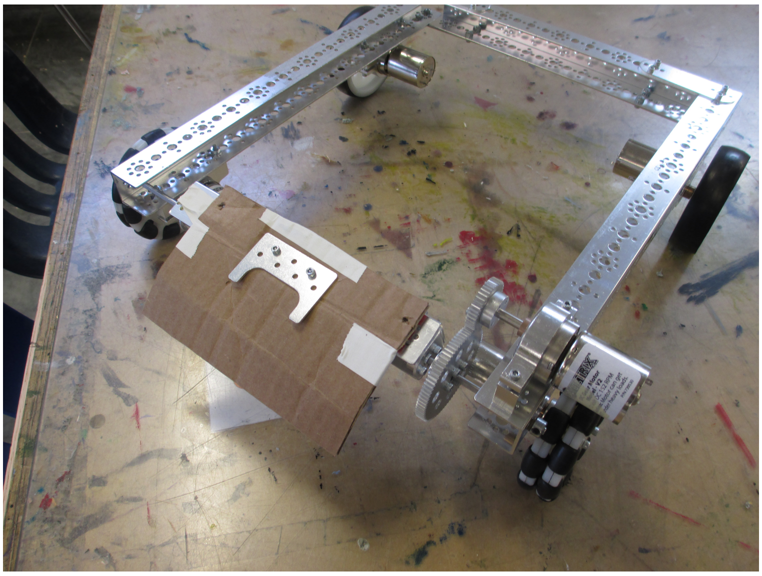
Alex Iverson
2014-10-20
Code Listings and Git

I worked with David to set up code listings.	We are using the listings package and have created a custom style for RobotC which formats and colors the code like the RobotC development environment does. It is also set up to be automatically available to any of our entries.
I continued to help Ben and Nick use Git.	Nick is getting better at merging, but is still not able to handle the full process independently. I had to re-teach Ben how to save a file and quit in vi, which is used by the git bash for Windows to write commit messages.
I helped Nick put together the basic robot frame for the test chassis.	Now that we have begun with hands on assembly, productivity is much better.

Matt Iverson
2014-10-21
Finishing Prototype

I finished the prototype for our intake mechanism.	The prototype works, but it's going to have to go a long way to be implemented on the competition robot.

I showed the previous prototype to the rest of the team, and we decided that having the cardboard bent would be more effective at picking up balls. I then cut out a section of cardboard that fits the entire shaft of the intake, and folded it similarly to the original. This is the result:



David Rohrbaugh
2014-10-22
Code for Moving Servo with Joystick

This week I worked on building the field with Ben and Filip. We cut out most the plywood pieces at our FRC team's shop, and finished cutting out the pieces at our on-site shop.	The only thing that remains to be done is screwing all the pieces together.

Ben Trout
2014-10-24
CAD Designing, Field Assembly

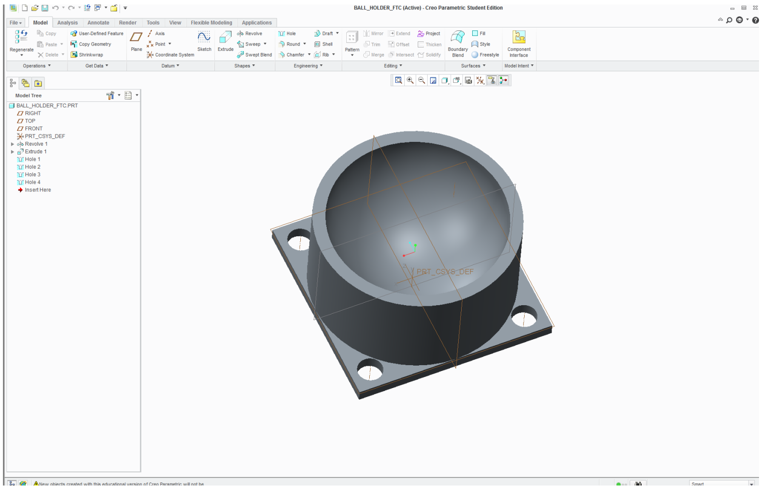
CAD Designing	Our current plan for launching the balls into the tubes is a slingshot. But we need a ball holder that will hold the balls and release them into the tube. The best way to do this is to make a piece on CREO that can perfectly fit a ball and has four holes that can attach to the surgical tubing. Filip and I were in charge of building this piece on CREO.
Field Assembly	Now that I have all the pieces cut and ready to be assembled some members from other teams were willing to put it together. Rob, Eric, and JJ are going to put the pieces together. I got them started and went out to make sure they're on the right path and putting all the pieces together correctly. I plan on helping them less and less.

CAD Designing

I was in charge of designing the ball holder for our slingshot and building it in Creo. It was pretty hard as I'm new to Creo and it will take me a while to get used to. Will Werst, a member on my FRC team, helped me make the piece in Creo. He's a great teacher who knows a lot about Creo. With his guidance I was able to build the part using the revolve tool. Now all we have to do is take this piece that I CADed up and bring it to FRC. They have a 3D printer that can print our piece for us. CADing up pieces can be incredibly useful. If we need to make a slight change to the design because the ball wouldn't fit in the cup we can easily just make the changes in CREO and spit out the piece again on the 3D printer. Now that I know the basics of CREO, Filip and I plan on designing our entire robot in CREO and this is what we'll be working on next week.

Field Assembly

It was a rough start for the build team but they've got it all figured out now. It took them a couple days to figure out how to put it together, but they have all the holes for one ramp predrilled and will start putting it together next week. I'll let them off on their own and we should have a built field here soon.



CAD image of ball holder

Nick Vosseteig
2014-10-24
Building, Wiring, Programming

Building	This week I built a frame for the robot and added the wheels, using holonomic wheels in the front of the robot to allow it to turn more easily. Matt and David worked on building a prototype for the intake device, but did not complete it.
Wiring	I also did all the necessary wiring for the frame so now the 4 DC motors necessary to drive are wired.
Programming	I wrote a simple program that allows us to control/test the robot with the Logitech controller.

Programming

This program allows us to drive the robot frame.

```
#include "JoystickDriver.c"

task main()
{
  while(true)
  {
    getJoystickSettings(joystick);

    if(joystick.joy1_y1<20 && joystick.joy1_y1>-20){
      motor[left] = 0;
      motor[left2] = 0;
      }else{
      motor[left] = -joystick.joy1_y1/2;
      motor[left2] = joystick.joy1_y1/2;
    }
    if(joystick.joy1_y2<20 && joystick.joy1_y2>-20){
      motor[right] = 0;
      motor[right2] = 0;
      }else{
      motor[right] = joystick.joy1_y2/2;
      motor[right2] = joystick.joy1_y2/2;
    }
  }
}
```

We did not get a chance to test the code out yet, so we will have to do it next week.

Building and wiring

I built and wired the frame of the robot which has 4 DC motors, one for each wheel. The front wheels are 4 holonomic wheels set 2 on each side for stability and better ability to turn. The building and wiring went pretty well since I had done it before and knew what to do. The wires are still a mess, and I need to clean them up in the future.

Alex Iverson
2014-10-27
Testing Prototypes

I am continuing to help some team members use Git.	Although Nick is fairly competent at git by now, he doesn't know how to read the error messages. Ben still doesn't know how to use Git.
We tested the prototype chassis drive base.	The prototype chassis drives just fine now. Now we just need to add other prototype components to it.

Matt Iverson
2014-10-28
Fixing Intake Prototype

Corrected intake prototype	I had to make the sweeper slightly smaller

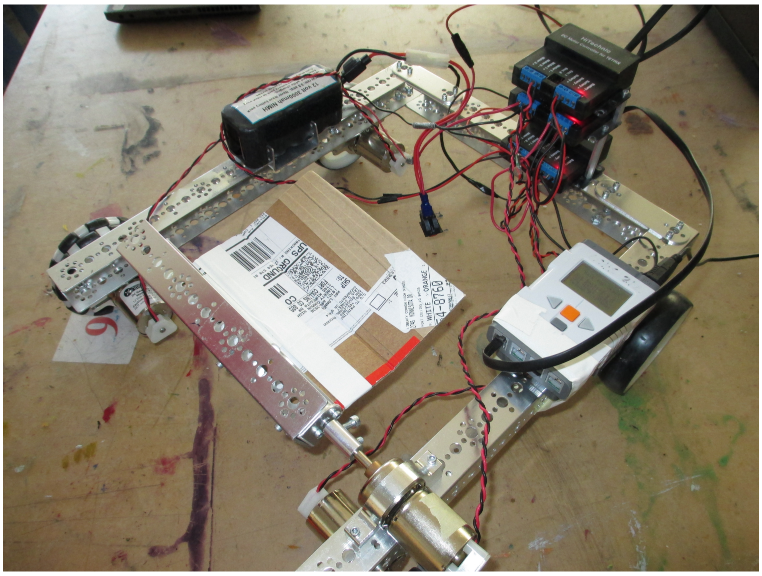
Unfortunately, David and I assumed that we would have 13" to work with, which turned out to not be the case. Since the front wheels are mounted such that there is no extra space for the sweeper, it will instead have to be mounted between the wheels. I reduced the width of the cardboard from 12.5" to 7".

Ben Trout
2014-10-31
Building Intake, CAD

Building Intake	Nick and I with the help of some other team members were in charge of starting the robot. While I worked on CREO last week Nick finished the base of the robot. This week as building really started to get under way Nick asked if I could help. Nick and I finished putting on all the wheels and while I attached the intake Nick wired all the wheels and the intake motor. we used a cardboard piece that we bent into a curve. We then attached another motor to the very front of our robot and screwed a TETRIX bar to it. Finally, we taped our cardboard piece on the the bar. By the end of the week we were able to get a driving robot with a rotating intake that can capture balls as it drives around.
CAD	Filip and I are still working on CREO to have a virtual robot. Will came down to help us again. He set up a folder in Windchill for us and made us our own personal workspaces in Windchill. We can now work on the same robot from different computers and log into our workspaces from any computer. Filip can start a piece and check that piece into Windchill and then I can check-out that piece and start editing the same piece Filip was working on earlier. Filip and I downloaded all the TETRIX pieces and using the assembly tool in CREO we will start assembling the robot. As we go we can also CAD up different pieces like the ball holder and use the 3D printer to print that piece.

Building Intake

The intake went well for just being a prototype. Our basic idea is reliable and we will probably stick with it. The only problem so far is we need a support on the other side since we're only using one motor. We also want to put it as far forward on our robot as possible so as not to interfere with any of our mechanisms such as the ball launcher. The only problem we had on the actual mechanism is the cardboard didn't have as much of a curve as it lost its rigidity over time. We'll definitely be using a 3D printed piece on our final robot.

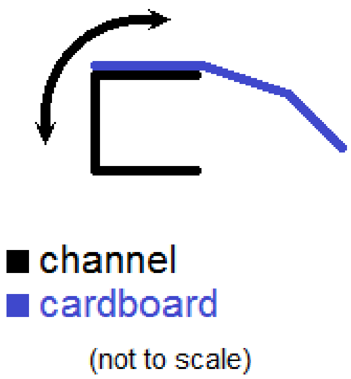


The first prototype of our rotating brush in the front of the robot.

David Rohrbaugh
2014-10-31
Prototyping the Intake Mechanism and Joystick Control

This week I and several teammates worked on prototyping the intake mechanism.	Our current intake mechanism is a folded carboard panel. It will most likely be replaced by a more suitable material. This material must be able to deflect enough, however, to collect balls when the robot is up against a wall.

This is a diagram of our current prototype for the intake mechanism. A Tetrix channel is attached to a DC motor so it rotates as shown. The carboard, which will probably be replaced by a more suitable material, makes contact with both sizes of balls, pushing them into our yet-to-be-constructed launching mechanism.



Nick Vosseteig
2014-10-31
Building, Wiring, Programming

Building	I continued building the robot and added the spinning prototype on the front.
Wiring	I wired the motor for the spinning intake device.
Programming	I added to the robot's code to make the 1 and 2 buttons on the controller control the intake device.

Programming

I added this section of code to get the spinner to work:

```
if(joy1Btn(2)){
  motor[intake] = 100;
  }else if(joy1Btn(1)){
  motor[intake] = -100;
  }else{
  motor[intake] = 0;
}
```

This week we tested out the code and got all the motors working. There was one bad motor which we replaced, and then the motors were not assigned correctly in the code. We just went through and tested each one individually to correct it.

Building and Wiring

This week we mainly built more on the robot frame and added the prototype intake device on the front:

Alex Iverson
2014-11-3
Intake Testing

I helped test the intake.	Although the intake seems to work well, it will not be able to pick up balls pushed up against a wall and it takes up a lot of space in the robot. We may need to redesign it later.

I suspect that we will need to redesign the intake. I think that we will need to move it forward and down to increase the space available in the robot.

Ben Trout
2014-11-7
Building Intake, Designing

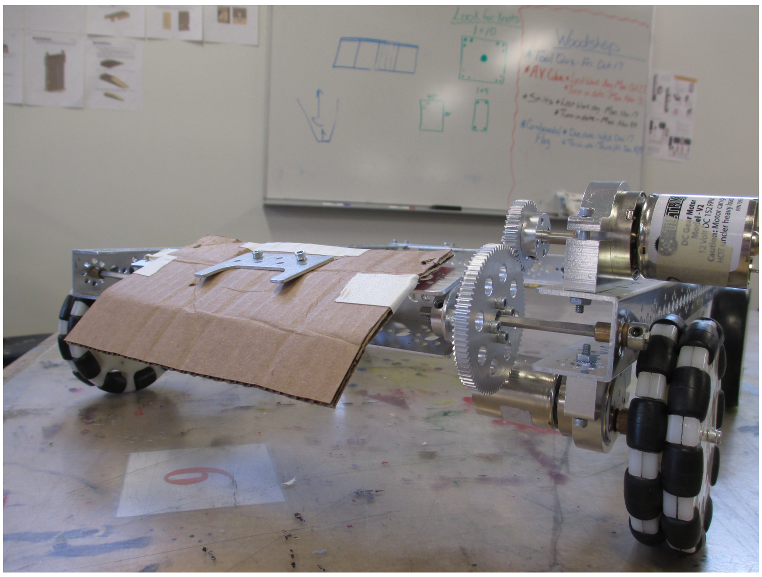
Building Intake	As this week got under way we soon realized we wanted to put the intake farther forward and lower to the ground. We lowered the bar farther to the ground and put it to the last hole to the front. It was an easy solution to move the bar lower to the ground as we just added some gears and slipped the intake onto two bars that go into the two side bars. By doing this we gave ourselves a good couple of inches of extra room for the rest of our mechanisms in our robot.
Designing	As we analyzed our robot and realized what limited space we had we soon came to the conclusion as a team that we needed to change shooter mechanisms. We decided that a slingshot was too risky and would not be adequate. We switched to a ramp that the balls would go up and into the tube. As these balls went up the ramp a whacker would spin around and fling the balls up the ramp into the tube. This is still a beginning idea, but has promise.

Building Intake

Our first intake went very well. There was just one problem with it: the intake took up too much space in our robot and we wanted to greatly reduce this. So what we did first is move the intake to the farthest bar forward; that was an easy change. Our second idea to reduce space was to move the intake farther to the ground so we can cut the cardboard and reduce the amount of space it takes up when it revolves around. To move it farther to the ground we added two gears, one attached to the motor and the other attached to the bar the intake was on. We attached two bars to the sides of our robots and attached the intake to those two bars. The two bars on their own would wobble around and I tried to stabilize the bars, but Alex pointed out that once we attached the intake to the two bars it would make the whole mechanism rigid. Our original intake used a structural bar and we were afraid that it would not allow enough clearance for a big ball to go under. We tried to attach a small bar across the two beams and use that as our main piece for the intake, but it wasn't strong enough. We ended up just going with our original intake and it does give enough space for the big ball to go under. Our intake is officially done. We cut down the cardboard and there's no way we can move it forward or lower anymore. We are pleased with the intake and will move onto the shooter mechanism next week.

Designing

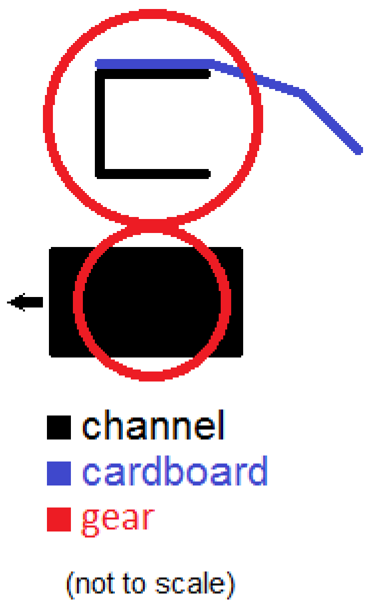
Our main problems with the slingshot is it took up too much space, didn't have a reliable way to reload that didn't take up a ton of space, and didn't have an easy way to get the balls into the holder that was reliable. As we were messing around with our new intake we soon realized that with the motor on very little power and a lot of weight on it could fling a ball pretty far up a ramp. We rolled with this idea and are now going to build a funnel from the intake to a one ball wide curved ramp in the middle of our robot. A bar over the ramp that has a whacker attached to it will spin around and hit the balls up the ramp. This idea in theory will be much more reliable and efficient. We don't have to worry about reloading; we can have a constant stream of balls; funneling the balls into the ramp will be easy; and we don't have to worry about surgical tubing that can wear over time. My only concern with this new design is that balls could easily get clogged in the tube if the whacker can't hit them high enough or has one misfire and this could lead to a whole lot of trouble. I drew up a design for this and we'll be starting on it next week.



David Rohrbaugh
2014-11-07
The Intake Mechanism, Samantha Module, and Electronics

This week, I worked on setting up the router and the flash drives for use with the driver station computer. The router used last year had to be reset and reconfigured. The flash drives also had to be made again. I have not been able to test my work because we are reconfiguring our robot's electronics to incorporate power poles.	All seems to be working properly as far as the Samantha Module is concerned. The robot's electronic parts with power poles incorporated are coming together.

This is a diagram of our current prototype for the intake mechanism. A Tetrix channel is attached to a DC motor so it rotates as shown. It is now geared up. The solid black portion is part of the robot's frame. The robot is facing to the right, with most of it to the left of this representation.



Alex Iverson
2014-11-10
Missing a week

I volunteered at an FLL tournament over the weekend.	The tournament was a lot of fun. I probably should have washed my hands a bit more though. I fell ill soon after returning from the tournament.
I spent the first few days of the week sick.	I could not come to the meetings and missed the first day of the CMAS testing.
CMAS testing.	As a senior, I am required by the state to take a standardized test. The testing sessions overlapped with the robotics meetings.
I went to an ACT Congratulations Ceremony on Thursday.	The Colorado State Board of Education organized a ceremony to recognize students who scored a perfect 36 on the ACT. As one of those students, I was strongly encouraged to attend.

I was not able to get anything done this week in robotics.

Matt Iverson
2014-11-11
Improving Intake

I helped fix the intake.	The intake isn't functional yet, but it's working better than it was earlier.

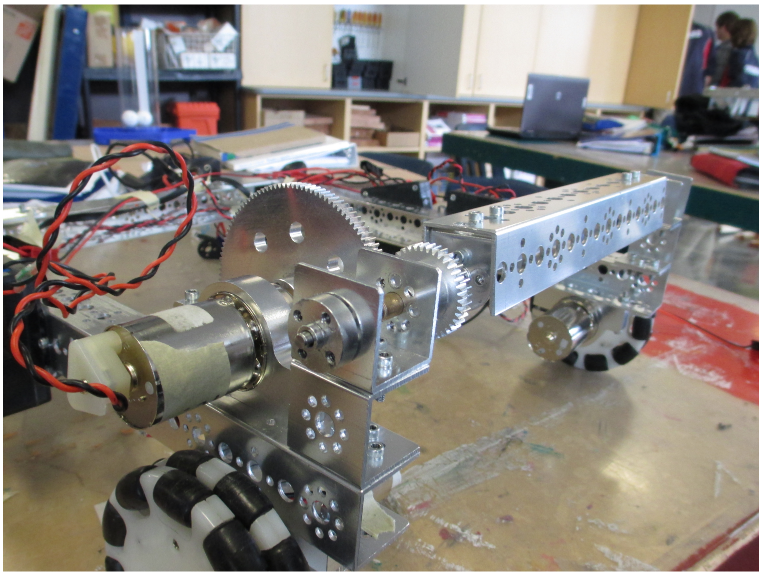
While testing our first attempt at making our robot score while fitting inside an 18" cube, the intake started squeaking and then stopped working entirely. It turned out that the screws attaching the motor to the chasis hadn't been tightened all the way, so the gears were slipping and eventually lost connection. I fixed the screws, and the rest of the team made sure the other parts were going to stay in place and strengthened the intake in other places.

Ben Trout
2014-11-14
Building

Building Launcher	At the beginning of the week we had an intake and that's about it. As the next step, building the launcher, got under way we split into two groups. David and Nick started to wire the whole robot while Filip, Matt, and I started to build the launcher. The idea is simple. We have a bar attached with a gear ratio to a motor. The bar has another cardboard piece to it that hits the balls. Our gear ratio is a 3:1 allowing the cardboard to hit the balls with more force. We put the bar higher up allowing us to have a longer piece of cardboard. We also put the launcher at the front of our robot taking of our original intake.

Building Launcher

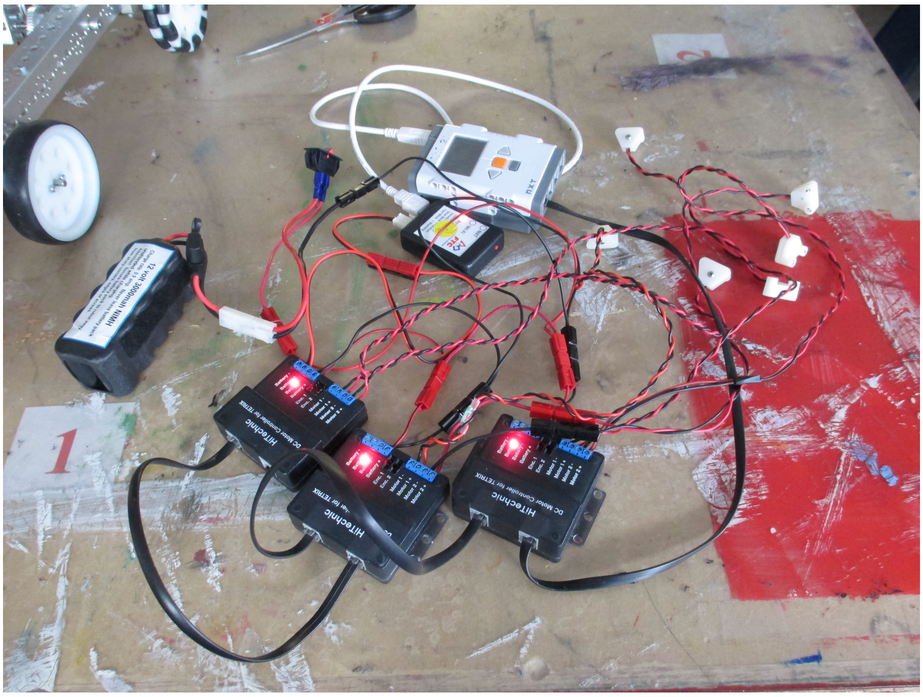
Building the new launcher was easy. It was basically a replica of the intake just had a swapped gear ratio to make it go faster. It didn't take us long though to realize that having an intake and then a launcher that were identical was inefficient. We didn't need an intake if all we had to do is drive around and hit the balls with our launcher. We originally had the launcher behind the intake and as the intake took in the balls the launcher would spin around and hit them up a makeshift ramp we made. We had many problems with this: from the two cardboard pieces hitting each other to the balls getting stuck under the cardboard as it swung around. We took of both the intake and launcher at this point. We put the launcher at the very front of the robot putting it two bars higher than before allowing us to have a larger piece of cardboard. By moving it to the front we have all that space in the back available now for the ramp. By moving the axel up two bars we won't have to worry about the balls getting stuck under the cardboard as it can swing out farther and scoop them in. Next week we'll focus on building the ramp we'll be flinging the balls up.



David Rohrbaugh
2014-11-14
The Samantha Module and Electronics

This week, I worked on the electronics with Nick. We finished implementing power poles into our wiring, and put the wiring back on the robot, but better this time. The Samantha Module seems to not be working, but a real test will have to be run.	The configuration of the electronics was changed, so the power poles are a little bit out of wack. This can be fixed, however.

This is a diagram of our current wiring, but separate from the robot to aid comprehension.



Nick Vosseteig
2014-11-14
Building, Wiring, Programming

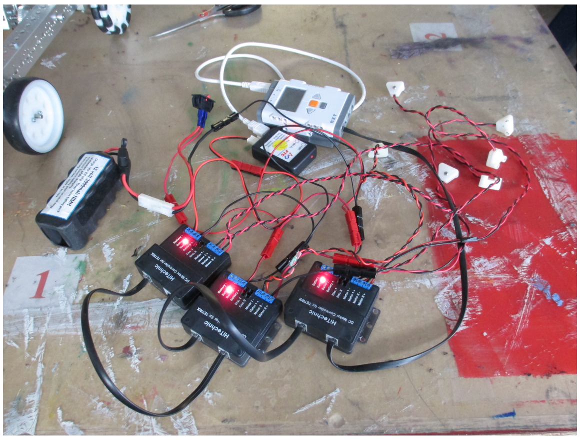
Building	We built two spinners, one to intake and one to launch balls up a ramp and built a ramp.
Wiring	David and I took the wires off in order to build and installed power poles into our wiring. We then reattached the wiring.
Programming	I changed the code to accomodate the new wiring and the new spinner.

building

This week we built an intake device and a spinner. However, upon testing we decided that this setup was not optimal due to problems between the two spinners. We decided to try removing them and making a single, larger spinner that we can use both as an intake, and a launcher.

Wiring

This week David and I worked on the wiring. We added power poles onto the wiring and then reattached it to the robot. Here is what the wiring looked like when it was not attached to the robot:



David Rohrbaugh
2014-11-18
Mentoring my brother's FLL Team

My younger brother is on an FLL team, coached by my dad, of which I used to be a member. This team was started back in 2009, when I was in 5th grade. My dad and another dad coached it. As of last year, I was the only official orignial team member still on the team. I helped the team to transfer the subroutines from last year for NXT-G 1.1 to NXT-G 2.0, as I worked on many of these programs. After this I provided general programming advice. The team has advanced to the 2015 World Festival and will compete in late April.

Here is a picture of me with the team:

Matt Iverson
2014-11-18
Cutting cardboard

What you did this week:	Reflections:
I cut some pieces of cardboard to make the base of the ramp.	The cuts didn't turn out the best, but we did make a very distracting frisbee.

The sides of our ramp are made out of cardboard circular pieces. Drawing a circle is hard enough, but cutting it out of cardboard with scissors is extremely difficult. The pieces weren't quite symmetrical, but they're close.

Ben Trout
2014-11-21
Building

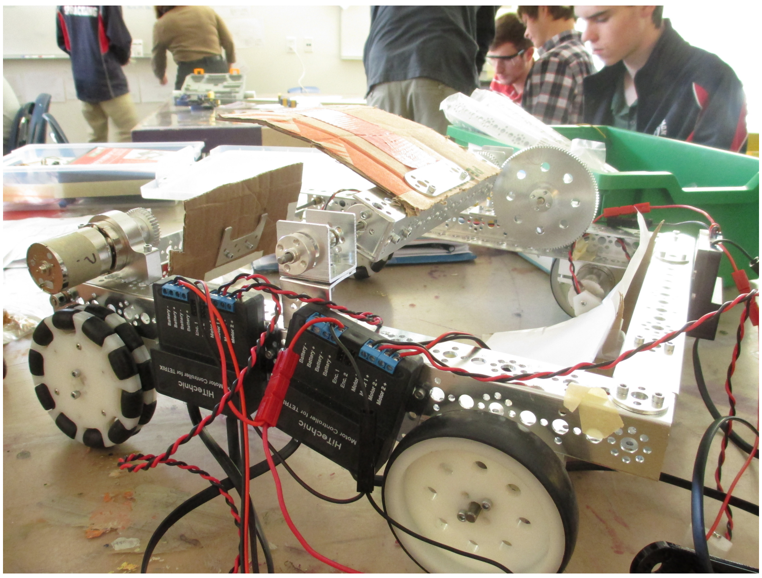
Intake	With the help of Filip, I returned to the original idea with the intake at the front and the launcher behind it. We moved the launcher to the middle of the robot, but still with the same gear ratio and height of the ground. We put the intake back on the robot exactly where we had it when we had it there before: right at the front as low as possible (between the bar).
Ramp	Matt and I were put in charge of making a ramp for our robot. We made a circle with radius 6in in a cardboard box and cut it out. We then drew tangent lines to opposite sides of the circle and connected the tangent lines. We cut these lines out making a square with a curve radius 6in going from one corner to the next. This will allow the ramp to have a nice smooth curve that the ball can easily travel up. Matt and I then put supports on the back and front of these two curved pieces attaching them together. We finally got a piece of cardstock and taped it along the curved part of our cardboard sides making a rigid and smooth ramp.
Claw	One of the final pieces to our robot is the claw that will hook onto the rolling goal and drag it around with us as we launch balls into it. I had Matt head this, but helped along the way. We got two servos that attach to the back of the robot that have a bar connected between them. Attached to the bar are two claws perfectly spaced to hook into the holes on the rolling goals. The servos will bring the claws up allowing the robot to fit in the 18in by 18in box and then release them down when we are ready to hook into the rolling goal and drag it around with us.

Building Intake

Once Alex finally returned he pointed out the flaws in having the intake and ball launcher being the same thing at the front of the robot. We need these two to be separate because the intake needs to be flexible to pick up balls of the wall while the launcher needs to be rigid to hit the balls up the ramp. We went back to our old plan which was very easy because we saved our original intake. Rebuilding the robot as we had it before was super easy. It was just a time game and Filip helped me put it back together as we had it before, only difference was our intake is the same as we had it when it was in the front of our robot.

Ramp and Claw

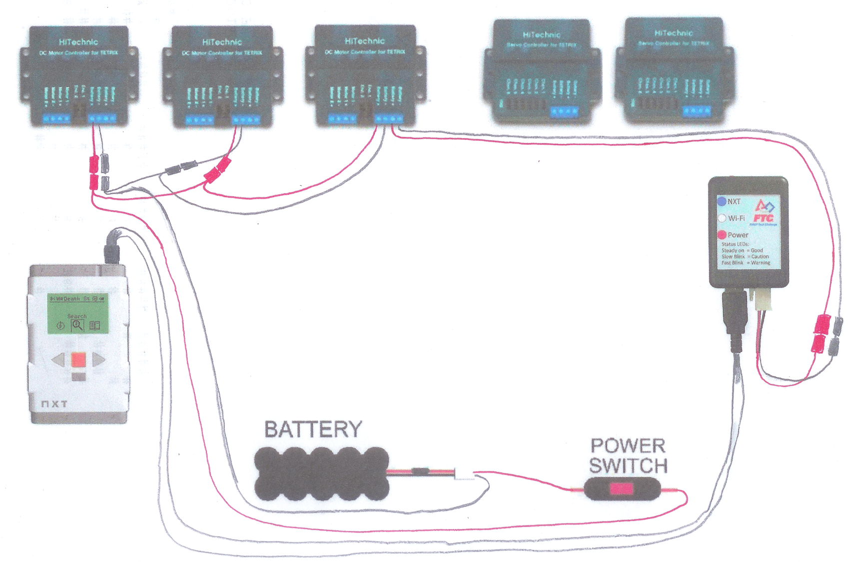
As the intake got done and Nick and Alex started to rewire; Matt and I started to work on the ramp and claws. I had Matt do the ramp first time around while I finished the intake, but we only had regular paper at that time and the ramp was slanted as the curves weren't symmetrical. As I finished up with the intake I helped Matt and we learned from our old mistakes. We made sure the circle was perfectly round and made sure our tangent lines were perfectly tangent, because if they weren't we'd have an angled ramp to one side like we had last time. We carefully cut out every piece and taped it all together. We then got cardstock instead of paper and used that for the ramp as it is sturdier and will last the impact of a ball going up it. As we finished the ramp we moved onto the claw. It is still in the very beginning stages and we have no pictures right now as we're just messing around with the idea, and only have conceptual images in our heads of what it would look like. How I described it above is how it will most likely end up being. Right now it's a lot of messing around with different positions of the servos to make sure they pivot the claws up and down.



David Rohrbaugh
2014-11-21
The Samantha Module and Wiring Diagram

This week, I worked on the Samantha Module. It is still not set up correctly, but we are taking steps to make sure it works.	The configuration of the electronics was changed, so the power poles are a little bit out of wack. This can be fixed, however. The router may need to be reconfigured, as the Samantha Module is still not working.

This is a representation of our current wiring setup.



Nick Vosseteig
2014-11-21
Building, Wiring, Programming

Building	We moved back the large spinner and added a new intake device so we can pick up balls from the walls.
Wiring	Alex, David, and I worked on the wiring after finding a few problems. David created a wiring diagram.
Programming	I updated the program so that it works with the new configuration

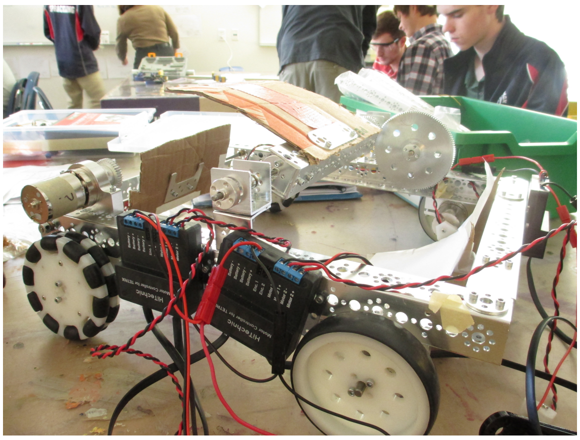
Building

After adding the larger spinner, we realized that, while it does work better, it has the disadvantage of not being able to pick up balls that are shoved against the wall. We added a smaller spinner on the front to get the balls off the wall and moved the larger spinner further back on the robot. We also created a prototype ramp out of cardboard that worked much better than the makeshift ramp we were using to test before.

Wiring

We found a few problems with the wiring and got them fixed.

Here is a picture of the new setup with both spinners and the wiring on the sides:



Alex Iverson
2014-12-01
Rewiring

Conversion to powerpoles	I started work on rewiring the robot using powerpoles to ease maintainence. However, to permit continued testing and hardware development, it must be done slowly and piecemeal.
Plastic Parts	We began planning for the conversion of parts of our ball handling system from cardboard to plastic. I hope that these efforts aren't premature.

We have began converting the robots electronics to use powerpoles on all the power cables. This will make maintainence much faster once it is complete. I am also working to improve the wire routing on our robot. We will probably want to solder short wires terminated in powerpoles directly on to the motors rather than using the plastic clip provided in the kit. This will result in a slightly reduced profile of the motors and a more sturdy connection.

Ben Trout
2014-12-5
Building, Testing

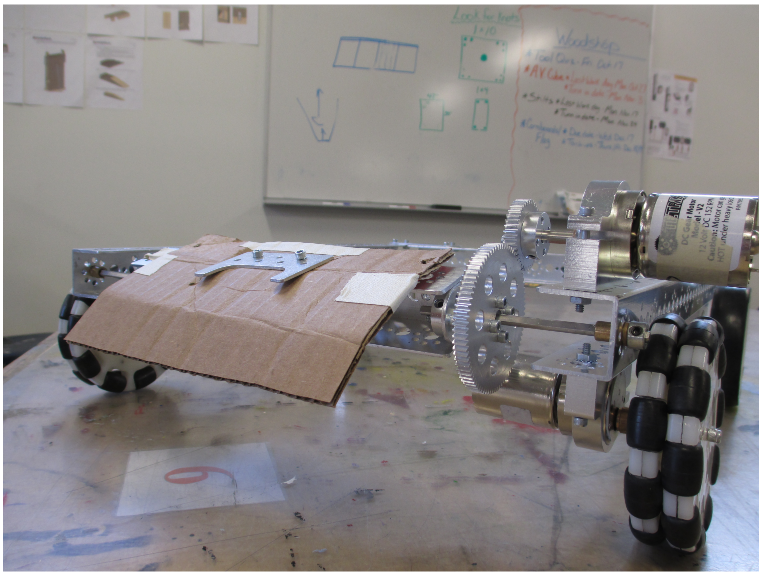
Building	This week Matt and I finished the part on our robot that grabs the rolling goal. It has a servo motor attached to the back of the robot with an axle hub screwed to the servo. We have two axles hooked together with a brace. The one big axle is pushed through two L brackets so the servo has minimal torque on it as we drive around.
Testing	Last week we basically had our robot ready to test whether or not the spinner can hit balls into the air. This week we got it ready for testing. Alex made a plastic spinner while we finished wiring. Nick, David, and Alex are usually in charge of wiring, but near the end of the week I helped Nick finish it up. We watched a video on how to solder and I helped Nick solder the wires to the motors. This will help us not have to worry about the motor hubs coming off in competition, and will save us room horizontally for the spinners. After all this was done we made some cardboard guides for the balls and taped the ramp down. The testing was successful and we could launch small balls all the way to the ceiling.

Building

The grabber that grabs the goal is all done now. We can't test it till next week, but for how simple a thing is, I was surprised how many glitches I'd run into. At first I tried have to servo motors so we wouldn't have to worry about torque being an issue. I soon realized that having two servo motors would work because they'd have to be flipped upside down of each other, and when you flip them they only go down half a bars length not lining up the axles. I quickly scratched this plan and moved onto one servo motor positioned so the axle will be directly down the middle of our back bar. I at first just had the servo attached to the axle, but this would cause too much torque on the servo as we drove around. I attached to L brackets to reduce torque and give the axle stability as it spun. The biggest challenge with this whole process was getting the axle in a position that I could thread it through the holes of the L brackets. There was a lot of switching the servo around and moving L brackets around to position that would potentially work.

Testing

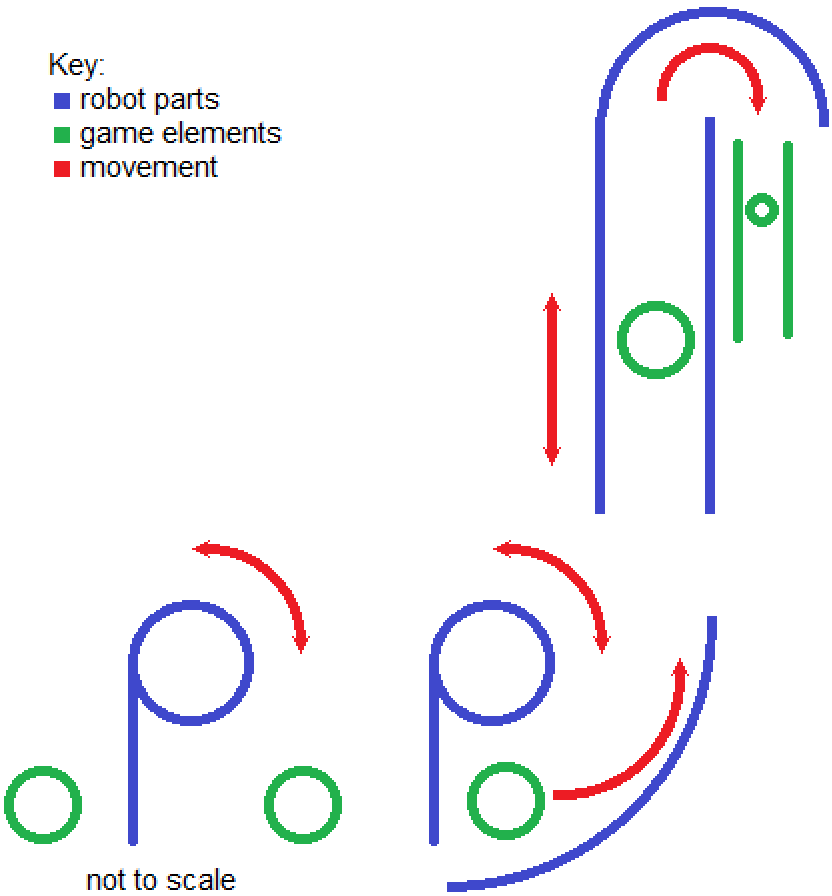
As we finished wiring and building we tested Friday after school. We quickly hit some problems as we started. Our spinner would spin so fast it would shake the whole robot causing our light weight paper ramp to bounce up and get hit by the spinner. We did a quick fix by taping it to the ground, but our final plastic ramp should be heavy enough for this to not happen. This will be a concern though, and we may have to cut our spinner down a little more. Some other problems was our guides for the balls were taped to the ground also, but we'll be working on a way to attach them to the robot next week. Another problem we encountered was every once in a while the spinner would hit a ball perfectly on the top it would cause the spinner to stop and skip some teeth. We may fix this by putting an encoder on the motor and when it feels irregular force against it, it will stop for a split second allowing the ball to pass through. The final problem we encountered was we couldn't launch the big balls very high. This was largely do to the fact we had a paper ramp and it would get smashed by the big balls not allowing for quality launch. We think a plastic ramp will fix this, but we'll need to keep it in mind. The only other small problem we had is big balls have trouble getting under the first intake, but as it spins they can get under. The big balls do get stuck though, and we may have to remake the front intake for more clearance between the axle and ground.



David Rohrbaugh
2014-12-5
Encoders, Wiring, and the Launching Mechanism

I did a little bit of everything this week. I put encoders on the two drive motors, worked with everyone else on the wiring another day, and helped Alex with the new plastic launching mechanism.	The encoders have not been tested yet, as the wiring is still being figured out, but they should work. I believe that the wiring is nearing completion. Our robot is starting to come together, as even with a flimsier cardboard launching mechanism it can fling a ball to the required height. Eventually, this fling will be directed into the goal with another mechanism. We replaced the cardboard with plastic.

This is a graphical representation of our overall plan for getting balls into goals:



The basic idea goes something like this: the first spinner collects balls, the second spinner launches the balls into the tube, which redirects them into the goal. The redirect tube has yet to be implemented, but we have some materials available that may be suitable, e.g. metal ducts.

Nick Vosseteig
2014-12-05
Building, Wiring, Programming

Building	This week we replaced the cardboard with plastic on the launcher and built a part to grab the base of the tubes.
Wiring	Alex and I worked on the wiring and soldered the wires to the motors.
Programming	Updated the code and changed controller configuration.

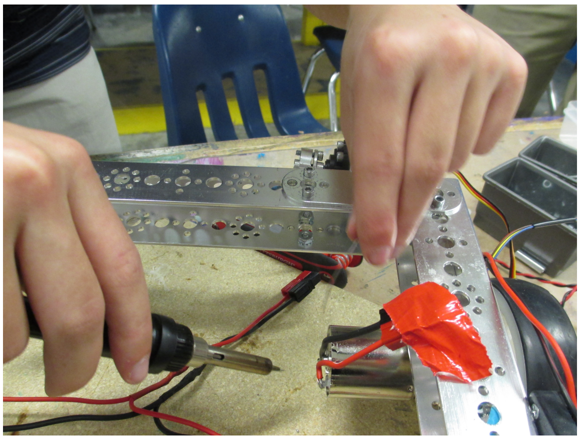
Building

We built a grabber on the back of the robot to grab onto the base of the tube and drag it with us. We also replaced the main launcher with a plastic counterpart so that it is stronger, hits the ball with more force, and doesnt break very easily.

Wiring

We fixed up the wiring some more and soldered the wires to the motors to make them stay on better and to save space.

Here is a picture of me soldering the wires to the motor:



2014-12-8
Alex Iverson
Plastic Parts, Improved Wiring, and Deadlines

Switching parts from cardboard to plastic.	I fabricated the plastic launcher part. Ben has begun the CAD for the plastic ramp and guide piece.
Rewiring.	I worked on converting more of the connections to using powerpoles.
Deadlines	Deadlines are looming and we are going to need to increase our effort even farther to meet them.

I used a vertical bandsaw to cut the plastic for our reinforced launcher. It is much stronger and our tests show that it is much more effective than the cardboard prototype. It is fabricated from a polycarbonate sheet. We are planning to print the ramp and guides out of ABS.

We took advantage of the downtime of robot testing while the hardware improvments were being developed to change more of the wiring to using powerpoles for ease of maintainance. We soldered pigtails onto the motors which terminated in powerpoles which slightly reduces the space requirements of the motors and increases the strength and reliability of the motor connections.

I created a quadraticaly scaled drive program to test and compare against the linear system currently in use.

```
int leftIn = joystick.joy1_y1;
int leftPwr = leftIn*leftIn;
if (leftIn < 0) {
  leftPwr = -leftPwr;
}
motor[left] = leftPwr;
motor[left2] = leftPwr;
int rightIn = joystick.joy1_y2;
int rightPwr = rightIn*rightIn;
if (rightIn < 0) {
  rightPwr = -rightPwr;
}
motor[right] = rightPwr;
motor[right2] = rightPwr;
```

We have started to organize meetings after school in order to increase productivity. Although we have been able to make quite a bit of progress during the longer after school meetings, we still will not be able to meet our deadlines unless we make our schedule even more agressive.

Matt Iverson
2014-12-09
Designing scorer

I drew a diagram of what our scorer will look like.	So far, everybody's been able to understand the diagram, but I haven't started building it yet.

The other members of the team made a backstop for the launcher, because the balls were getting launched at inconsistent angles. We don't have the ramp to test it right now, because we're trying to replace it with a 3D printed ramp that will be stronger and more durable than the current one made of cardboard and cardstock.

Ben Trout
2014-12-12
Creo, Testing

Creo	As we finished testing last week we all decided it would be best to have a plastic ramp. I volunteered to CAD and print it up. Making the ramp would be simple enough since we already have a perfect cardboard ramp. I started making the ramp to the same dimensions to the ramp we already had. I CADed up the entire robot up to date and made guides for the ramp.
Testing	This week as Alex and David finished up wiring by putting all the Samantha essentials on the robot we did our first teleop testing wirelessly. We attempted to hook on to the rolling goals, and for the most part it was successful.

Creo Ramp

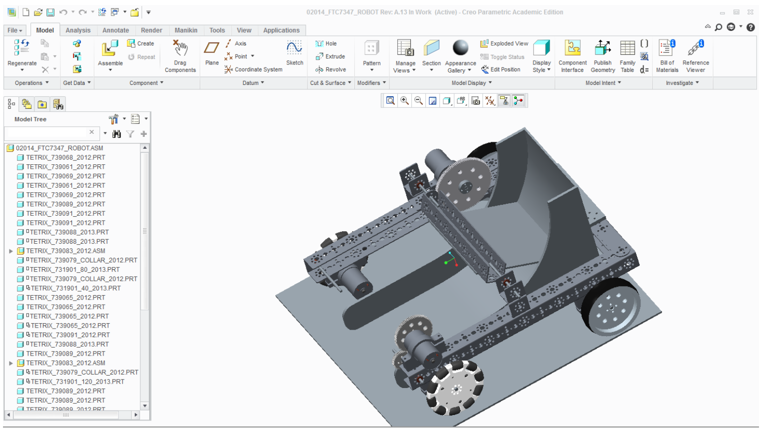
As I worked on the ramp, I realized how much plastic it would take to print it. I didn't want to have to print this ramp twice. I had started CADing up the robot at the beginning of the year, but left it off for a while. I decided to finish the entire robot in CAD so I can make sure this ramp will work with our real robot when we print it. Having a virtual robot will allow me to see how parts we need will fit on our actual robot and make sure they'll work when printed. With the ramp I decided to have the guides actually attached to the ramp and make the ramp wider. I learned how to curve the ends of the guides so they wouldn't get stuck on the foam in the field as we drove. I made two overhangs on the back of the ramp that go over the back bar. I gave slight room between the overhangs on the ramp and the bar they connect to for correction error. By far the hardest part of the ramp was aligning the holes on the overhang with the bars they are screwed to. The measure tool only does diagonal distance so I had to use the x y coordinates of the holes and transfer those over to the ramp model.

Creo Assembly

For assembling the robot. I downloaded a kit of tetrix parts. I started an assembly in Creo. I learned that you always start with one solid piece as the central piece of the assembly that everything is worked off from. I chose the farthest back bar as the default. This means everything on the x y z plane is measured from this bar. The main assembly tool I use is coincident which means you select two surfaces that will be touching each other, and this is how you align things up. I also learned how to use the distance constraint which allows you to set a distance two surfaces are from each other and CREO will constrain these two at those distances. This was most helpful for axles and also putting a ground touching the wheels. You have to use distance most often with rounded edges like wheels and axles as they have no flat surface to constrain too. The final thing I've learned so far is the pin constraint. This allows me to click on our spinner that spins up the ramp and test if it is the right distance from the ramp at all points.

Testing

Testing was pretty easy this week. My main goal for this week was to finish the claws that hook onto the ramp and drag it around. We were pressed for time so I just through some lego claws on the axle. We tested at the end of the week, and it was relatively easy to grab the goal, but we'll definitely have to make the claws out of a harder material to make sure they don't snap on the field. We also have to make sure that the claws have a finer point to grip the lip of the goals. We also used a continuous rotating servo and we'll have to switch that to a 180 because the continuous doesn't stay stiff.

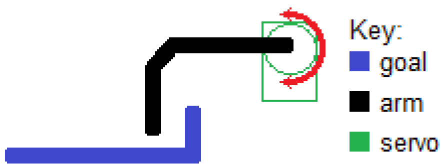


David Rohrbaugh
2014-12-12
The Samantha Module(s), Servos, and the HiTechnic IRSeeker

I did a little bit of everything this week as well. I connected each team's robot to the network at least once. I attached a servo controller and connected our goal-grabbing mechansim to it. I also started work on using the HiTechnic IRSeeker.	All three teams' robots have been connected to the network and controlled from the driver station. Our goal-grabbing mechanism is working, but it will be replaced with something more robust and the continuous rotation servo driving it will be replaced by a normal servo.

The only things that our team has left to do are making the scoring mechanism and 3D-printing the ramp that directs balls into the scoring mechanism, in addition to lots of testing.

Here is a diagram of our current goal-grabbing mechanism:



Nick Vosseteig
2014-12-12
Building, Wring, Programming, Testing

Building	We zip tied down the wiring to keep it out of the way of the spinner permanently. We also finished the grabber on the back to hold the tube.
Wiring	In addition to zip tying the wiring to the robot, I also wired the new grabber.
Programming	Updated the code to accomodate the new, finished grabber. I also worked with Alex to make the movement more easily controlled.

Building

We got everything to work smoothly this week with the exception of the new grabber. It uses continuous rotation servos which are not ideal and we will probably switch them out next week for regular servo motors.

Wiring

We got all the wiring completed and working and then we moved it all out of the way of the spinners so that we could drive the robot wirelessly.

This is the code for the grabber:

```
if(joy1Btn(6)){
  motor[intake] = -100;
  motor[launcher] = 100;
  }else if(joy1Btn(8)){
  motor[intake] = 100;
  motor[launcher] = -100;
  }else{
  motor[intake] = 0;
  motor[launcher] = 0;
}
if(joy1Btn(2)){
  servo[grabber] = 90;
}else if(joy1Btn(1)){
  servo[grabber] = 180;
}else{
  servo[grabber] = 127;
}
```

Matt Iverson
2014-12-16
Building scorer

We're putting on the cardboard prototype of the scoring tube, and hopefully we'll be able to test it successfully today.	The current prototype doesn't fold yet, so it doesn't fit inside the 18" box. Fixing that is our highest priority, after testing.

The ramp wasn't ready when we were testing, so we just dropped the balls in from the top of the launcher. Most of them got launched out the front, which was to be expected, but the few that did go back up made it all the way back out of the launcher, so that's a good sign. Hopefully we'll be able to test with the ramp on Friday, the next time we meet.

2014-12-19
Filip Lewulis
Construction and Networking

Construction	We rebuilt and rewired the robot to accept the original intake before the launch system, and built a temporary ramp following the curvature of the launcher.
Networking	Our Samantha module finally has been flashed with the proper network configurations. It was not usable in time for the demo, but the wireless controls are almost working.

Ben Trout
2015-01-09
Building

Telescoping tube	The tube has two sections each made of wood and both the same height. The smaller section is attached to the robot via two of the smallest one hole channels at the base of the small section. The small section is attached to the robot at about 3 inches from the floor as to make sure it doesn't catch the robot. The larger section slides over the smaller section with two slots cut out of the base to fit over the two channels supporting the smaller section. The larger section is secured to the top most slide of our linear track.
Linear drawer slide track	As a group we decided the best way to extend our tube from a compiled position would be to attach it directly down the middle of our robot connected to the center beams that form the back bars of our robot. Filip attached the two L brackets that are screwed to the back beams of our robot and figured out the best place to fix the slides. The track is two linear drawer slides bolted to each other. Nick and I drilled out the corners of the biggest tracks of each linear slide. We then stuck bolts through the holes with a spacer on each bolt. With the help of Alex we were able to route the string starting from a motor, up to the top of the first track down to the bottom of the first track, up to the top of the second track and tied to the section bolted to the slides. This would create a pulley system that would allow a motor to easily lift up linear drawer slides to any desired height whether that be 30, 60, or 90cm.
Ramp and guides	The ramp is essentially one square piece of polycarb that Nick and Alex bent using a heat gun to get the right shape of the curve. I cut out two guides out of the polycarb and taped those to the inside of the smaller section of the tube. We made sure the larger section could still slide over the smaller section of the tube. The guides have overhangs that Filip helped me drill out and attach to the robot with bolts.
Deflector	Matt originally designed the deflector and his design idea is what we ended up going with. It is pretty simple: It has two forty five degree angles with a flat section between the two angles. The ball comes up gets deflected of one of the other and through a small hole into the tube. Matt's design had a couple flaws and Alex was able to redesign it perfectly centering the exit of the deflector around the hole of the tube we are dragging around.

Telescoping tube

The tube was initially made into three pieces that fit inside each other. It was relatively easy to make each different section as it took some quick measuring. Each smaller section was exactly two width of the wood smaller than the section before. It wasn't until we had attached the linear drawer slides that we really figured out how to assemble the tube. How we made sections of the tube we decided it wasn't feasible to use all three sections. Instead we used two, the smallest and biggest. One of our biggest fears was that by going biggest to smallest would leave edges the balls could catch on their way up and fall back down. But we needed a way to secure the inmost box to robot and this isn't possible to do with the smaller box if the larger one needs to slide over it. But we came up with a solution. I cut out slots in the large box while Nick attached two single channel pieces to the base of our robot. Nick had to make sure to put spacers between the channel and back bar so that as the sections came back down they didn't catch on the bolts securing everything. The small section is bolted to these channels and the big box is still able to slide over because of the slots cut into it. The only problem left with this mechanism is it leaves a big gap for balls go go flying out. Our plan now is to attach some sort of cloth that is rolled up at the bottom of the large section of the tube and as it is raised the cloth will fall down and block balls from flying across the room. By using cloth we can bunch it up and allow for us to still be inside the 18in by 18in starting position.

Drawer slides

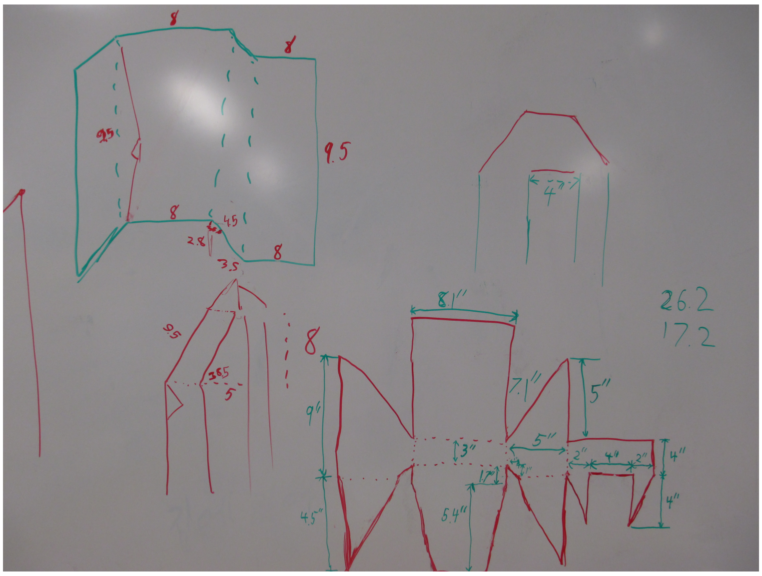
I went on the Lowes sight and figured out what side drawer slides we could get and still be in the 18in box. I ended up choosing the 16in drawer slides from Lowes. Me and Nick were put in charge of putting all the slides together and making a pulley system that would lift the tube. Initially we had attached the two slides to each other from small end to small end. We drilled out holes in the large sections of the slides, one at the top and one at the bottom. Me and Nick then made a pulley system that had string threaded through spacers that were bolted to the slides. The problem with mine and Nicks design was that we could only lift the slides to the 60cm goal as our pulley wasn't set up right. With the help of Alex on a later day we were able to make the correct pulley pattern that allows us to get to the 120cm goal. All me and Nick really had to do was switch the slides so they were attached small section of first to big of second, and then we tied the string of to the top section of our tube instead of the bottom final loop of the pulley. We had our biggest difficulties with determining in drilling and placement of the slides. In drilling we had to be very precise and the fact that the slides have rounded edges made it very hard not to slip, in the future it would be helpful to have a center punch. Placement was another big decision. As a group we decided that the middle of the back beam would be ideal, but this would push our ramp up, which would force us to move our spinner up, which would force us to cut our intake down, and this just wasn't feasible as it wouldn't be able to intake the small balls anymore. Filip and Matt were then put in charge of taking out the back channels of our robot and replacing them with angled bars would be the best option. This would allow us to move the whole assemble back to its original position and we wouldn't have to cut anything down.

Create guides and ramp

I was put in charge of creating the ramp and guides with the help of David and another team member from FRC. We used the drawing tool in creo that makes a drawing of one side of a model and can print that out on paper. We cut out this drawing and traced two of them on polycarb sheet. Using a band saw we cut out both side panels of the ramp. Using the measure tool in CREO I was able to figure out the dimension of our ramp and back base. Using a heat gun we were able to bend the back piece and braces of the guides that get bolted to the robot. Bending was pretty difficult and by no means reliable. The back piece was so bent well and when we put the ramps into the bends of the back piece to attach them the guides didn't even touch the ends of the back piece as the bends weren't perfect 90s. We tried epoxy first, but the surfaces didn't meet enough for this to be effective. We ended up drilling holes in the corners of the bends and bolting the ramp to the guides. This ended up not being a good idea at all because the bolts would get in the way of the ramp. Once we had the tube attached to the robot though it became a lot more clear how we could attach the guides and ramp. The guides could be taken of our poorly created back piece and merely taped to the sides of the small section of the tube. Our initial idea for creating the ramp was to bend it around a piece of wood that has a 6in radius to get a perfect curve. We didn't have time to do this and Alex and Nick just had to bend it one piece at a time. For the next tournament we will definitely remake the ramp.

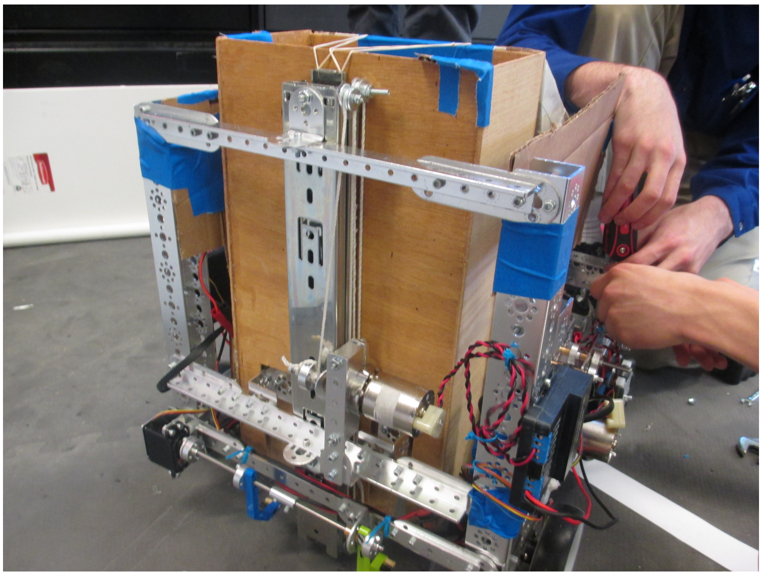
Deflector

Matt was initially in charge of the deflector and his design is what we ended up going with. It was pretty simple, but because we moved our tube around from where we initially thought it would go the deflector had to be remade. Alex used a bunch of measurements and designing to create a deflector that is directly over the tube. One of the biggest problems was having the deflector start inside the 18in by 18in. Nick came up with the idea of putting rubber bands to the inside of the deflector and looping them around the top part of linear slides. The deflector is laid at a 180 degree angle to the the outer tube in the starter position. At the beginning the spinner spins around and whacks the deflector that raises up. Once the deflector is above a 90 degree angle the rubber bands take it the rest of the way and flip it into position.



Alex's calculations of the deflector

Linear slide and box tube in up position. Deflector flipped up.



Linear slide and pulley in down position.

Getting ready for competition

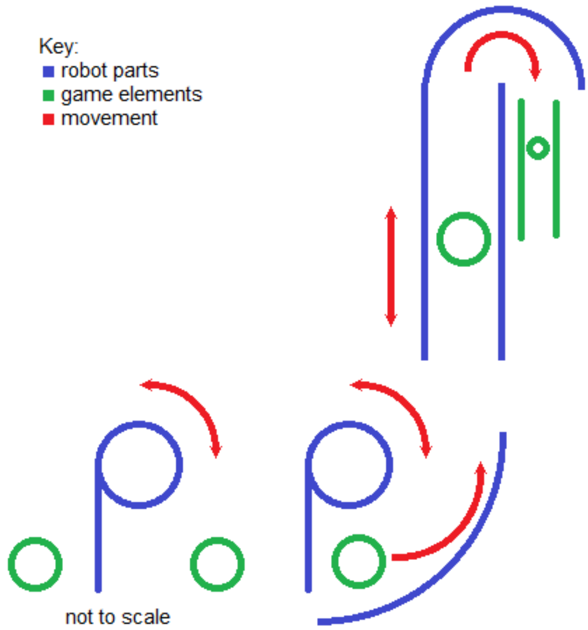
Our whole team has been getting ready for competition making sure the robot is competition worthy, but David has been mainly in charge of this. He has gone through all the specifications of our robot making sure it is not illegal in any form and has all the necessary parts. The rest of us have mainly working on making sure the robot starts in the 18in by 18in box and other small tasks.

David Rohrbaugh
2015-01-09
Fixing Up the Robot and Helping Other Team with Their Samantha's

This week I tightened almost all of the screws on the robot and removed the cardboard pieces that were protecting the electronics.	During our competition a few weeks ago one of our wheels was close to falling off in the final rounds. I tightened the screws on that wheel on most of the other screws on the robot, as many had become a little looser in the heat of battle. I also removed all of the cardboard on the robot as it will be replaced with polycarb before the next competition. I helped the two other teams (who have not competed yet) do a practice round. I have started to teach some of them how to hook the robots up to the driver station computer.

The deflector is being redesigned to more effective at scoring balls. At the first competition, many balls missed the tube because the deflector's opening was too wide and the geometry was a little off. We are exploring new materials for the guide tube, such as cardstock and overhead transparency.

Our main strategy remains the same. Here is a diagram representing our strategy:



Alex Iverson
2015-01-12
Return from Tournament

Lessons Learned.	We reviewed the events of the tournament and discussed what we want to improve before our next tournament.
Planning	We decided on what improvements are the highest priorities and how we want to implement them.

We decided that the highest priority is improving the deflector so that we can score large balls reliably.

Redesigning the guide tube and extension mechanism is also one of our top priorities.

Improving the blocker and developing an autonomous are also very important, but not immediately being worked on.

Matt Iverson
2015-01-13
Post-tournament wrap up, deciding on and prioritizing new tasks

We brainstormed about 10 tasks, and everybody got one high priority task to work on.	My task for the week is to find a single 18" axle to go across the front of the robot, since the axles we have at the front now are bending too much.

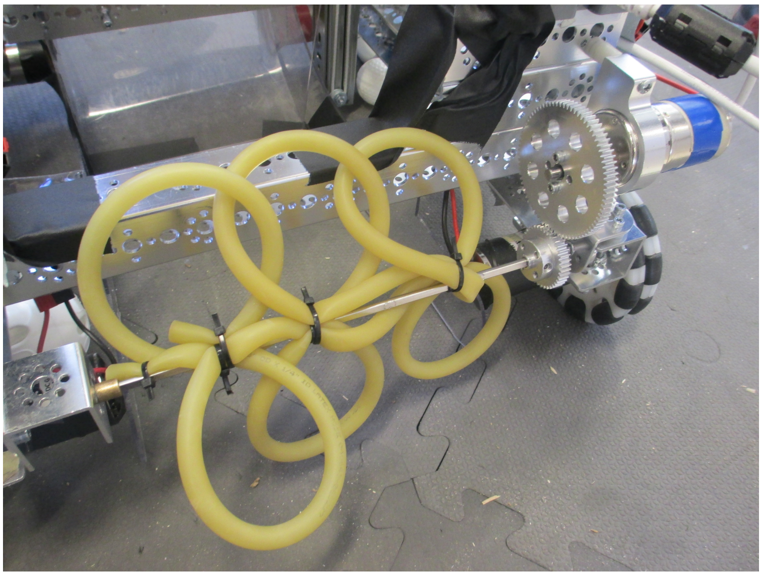
We competed last Saturday, January 10, and learned a lot about what we need to do. We had never actually driven our robot on the field before the competition, so we were expecting to have issues with the consistency of the robot. They were much worse than expected however. The slide we use to extend our scorer broke twice, so one of our high-priority tasks was replacing it. The gears that spin our hitter were grinding a lot, although I never did find out why. Despite all the troubles we had, we still managed to get invited into the 3rd seed alliance, and beat the 2nd seed to finish as the finalists.

Ben Trout
2015-01-16
Building, Brainstorming

Brainstorming	After our first competition as a team we went through all our weak points and where we could improve our robot. Collectively we decided that there were 6 things that needed to be improved on the robot. The guide tube, ramp, intake, spinner, deflector, and linear slide. We ranked these things from most important to least important and designated each section to a specific person. Matt and Filip redesigned the deflector, Nick and I were in charge of the intake and linear slide. David was in charge of the redesigned guide tube. Alex was in charge of overlooking all of it and making sure everything went as planned.
Intake	Nick and I first tackled the challenge of the intake. We ended up going with a single axle across the front of the robot to allow more clearance for the big balls and zip tied surgical tubing in a loop fashion around the axle. We also attached a support bar in the front third of the robot to prevent torquing of the robot. We kept the same method of spinning the intake, that is a DC motor with a 1:2 gear ratio to spin it.

Intake

Nick and I were first put in charge or recreating the intake. We had to make it more flexible, allow more clearance, and allow a support channel to be placed near by. Matt researched if Tetrix sold long axles that would span our robot, but to our surprise we actually found a 10in axle. This axle didn't span our robot though so me and Nick added some 90 degree angles and single channels that allowed us to use this single axle to span the distance. We decided on surgical tubing that would allow us to put on a support beam as the surgical tubing would just bend around the support channel. The only problem with the channel is it took up the space our motor was in. To solve this problem I made the support channel three tall and attached the motor to the support channel and using spacers with long machine screws I got the motor to reach the axle with the same gear ratio as before.



New Intake Design

David Rohrbaugh
2015-01-16
Working on a New Guide Tube

This week I did some more maintenance on the robot and helped the two other teams with their Samantha's, but I mostly worked on a new guide tube. It is made out a three pieces of cardstock.	This new guide tube is made to be close to the dimensions of the old guide tube, but instead out of cardstock. The three pieces of cardstock fit together in a similar way to one of the old wooden guide tube pieces.

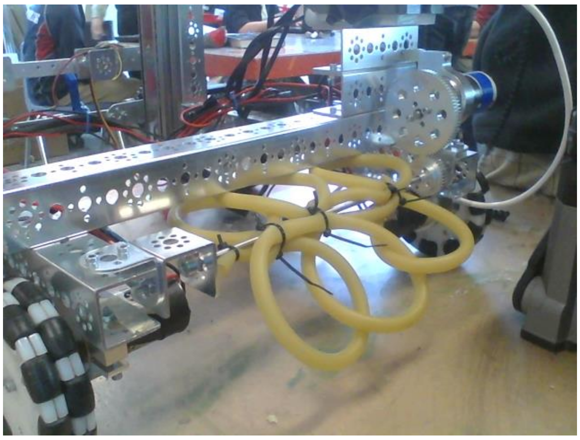
The guide tube is 7.5" x 4". The long sides are made out of one sheet of cardstock each and the short sides are made out of one sheet of cardstock cut in half longways. Here is a diagram of the design so far. It's a top view.

Nick Vosseteig
2014-01-16
Building, Wiring, Destroying

Building	We rebuilt the intake device so that it now uses surgical tubing and is on a single axle. We also rebuilt the linear slides because the old ones broke.
Destroying	We took apart a lot of the robot in order to remove the broken or temporary pieces from the competition. We plan to refabricate similar pieces with improvments and made out of polycarb.
Wiring	Some of the wiring was messed up after the competition so we fixed it up, but some will probably still need to be changed after we add back new pieces.

Building

Our front intake device was taking up too much space, would tip the robot up when picking up a large ball, and was not very effective at picking up balls off the walls. The new intake devices uses surgical tubing so that we could add a support beam behind it. The surgical tubing picks up balls well, and bends against the support beam allowing it to spin. Here is a picture of the new intake device:



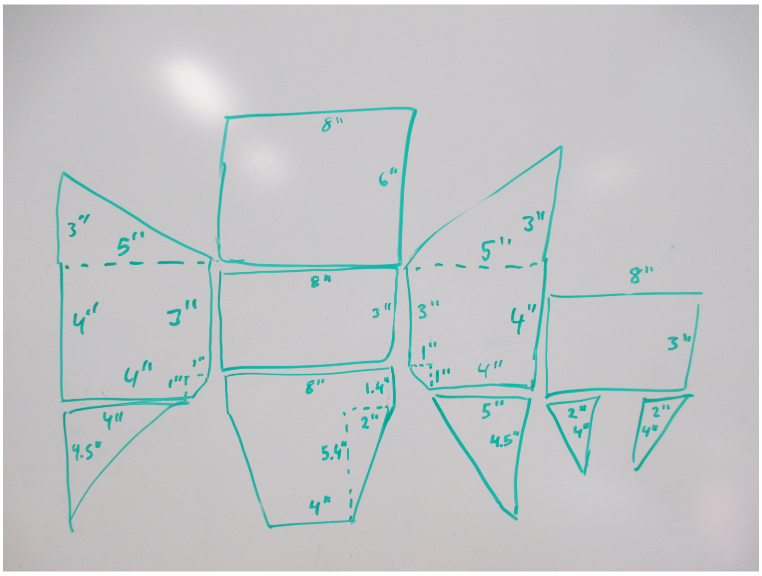
Destroying

The robot was put together with a lot of cardboard and some wood and tape. Because of this the robot had a lot of broken parts after the competition. We needed to remove all the temporary and broken parts so that we can work on more permanent, polycarb pieces for the next competition.

Alex Iverson
2015-01-19
Pruning and Redesigning

We removed the damaged components from the robot and the things that need to be updated.	The damaged guide tube has been removed. The intake has been removed and is in the process of being replaced.
Deflector improvements.	I put together a set of modifications to the deflector that should allow it to handle large balls reliably and score more accurately.

I recomputed the angles and lengths of the deflector so that it provides enough room for a large ball to fit through easily and so that it lines up with the mouth of a goal being handled by our robot. The geometric changes were fairly simple, but they did necessitate a full rebuild of the deflector. Communicating what needed to be done for the deflector proved more time consuming than it should have been.



Matt Iverson
2015-01-20
Building the new deflector

Filip and I are working on the new cardboard deflector to put at the top of our scorer.	We're almost done, and should finish either today or tomorrow.

We've spent the last 3 class days working on drawing up and cutting out the deflector on the cardboard. Alex gave us the 2D drawing to he wanted us to use. The first 2 days were spent getting the whole thing drawn onto the cardboard, and only yesterday did we start cutting. Neither of us have cut cardboard with the utility knife before, so Mrs. Lannen had to show us how. Once we got the idea, it started going pretty quickly.

2015-01-21
Filip Lewulis
Construction

Construction	The deflector at the top of the guide tube was assembled today, and the linear slide and back support for the ramp were added, though we had to stay after school to finish them. David's cardstock prototype for the guide tube had fitting measurements, so Ben remade the tubes out of cardboard until we get polycarbonate. We had trouble fitting the large dimensions within the size constraints of the map, so an unnecessary crease in each piece may undermine the structural integrity of the tube during testing. We've decided to try the reverse direction of the three parts to avoid ball collision along the edge.

I like how far we've progressed using the basic materials, but the ramp has not been 3D printed yet, so we are still unable to test the balls landing in the tubes or the lifting of the linear slide.

Ben Trout
2015-01-23
Building

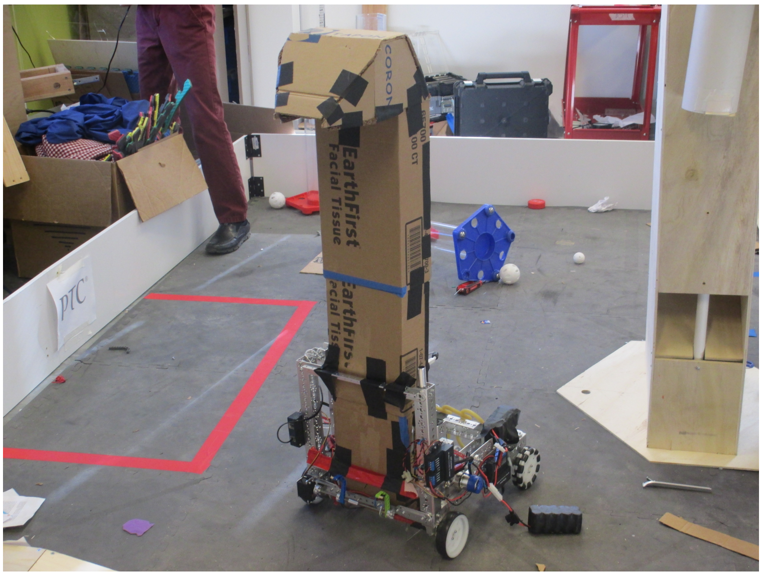
Linear Slides	While Nick worked on fixing the spinner, moving it, and replacing bent pieces, I moved the linear slide around. I attached the linear slide the the side of the robot. With the help of David we attached a channel parallel with our back vertical side channel. The motor is mounted to this channel too. The linear slide system is the same as before screwed to this bar with it's pulley system perfectly in line the the motor tip.
Cardboard Prototype	Alex is going to make a polycarb guide tube, but he wanted a cardboard proto to show proof of concept and get exact dimensions for the actual guide tube. The guide tube is three sections of cardboard starting with the largest 7 1/2in length, 4in width, and 14in tall. Each width and length step down by 1/4 every smaller section. All three sections are 14in tall except the smallest which is 15in tall. The medium has two slots cut in it 1in from both edges. The largest sections has two screws that slide into these slots and as it is raised the screws will go up the slots till they catch and then the medium section will be raised with the large section. The smallest section is screwed to the base of the robot.

Linear Slides

The whole goal of moving the linear slides was to allow us to push the guide tube all the way to the back of the robot. This would allow us to push the spinner back a couple holes and by redoing the intake we were able to put a support bar across the front middle of our robot for support. Setting up and screwing the linear slide to the side of the robot was the easy part. What was hard was all the things that it got in the way of. Filip had to move all the motors to the very back of the robot as the linear slide was hitting the motor. I also had a fun time figuring out the new placement of the motor. We wanted it parallel with the bar, but at the same time in line with the pulleys. We also had to stay inside our size limit. I ended up going with the motor perpendicular with the pulleys, but in line. This would allow us to stay inside the size and get the least amount of counterforce on the motor.

Guide Tube Prototype

David was initially in charge of protoing the guide tube and came up with the idea of having three separate sections that slide into each other. I rolled with this idea and prototyped a cardboard tube. Our spinner is 6.5 in wide so I made our smallest guide section 7in wide. Our deflector is 4 in length, so I made the largest section 4 inches in length. The rest of making the cardboard sections was easy because the cardboard and polycarb is 1/8 thick so I just stepped each section's length and width down by 1/4. I came across a couple problems while making the prototype though. First if you step each sections length down by 1/4 it causes a lot of friction as the sections have a lot of contact. For the final alex will give an extra 1/16 on both sides to make sure this doesn't happen. I made each section by cutting out a piece in cardboard the size of the section's perimeters; then I measured out each length and width twice and scored those lines. The cardboard then folded up into a perfect sized box. The only problem is for one width of each section you have to make it 1/8 in smaller because as it folds the length rests on top of the width which adds an extra 1/8 inch. I had to make the smaller section an extra in large because the small section fits between our wheels while the medium and large rest on top of the wheels. Adding this extra inch allows us to drill the small section stationary to the bottom of our robot base.



Cardboard Prototype

Nick Vosseteig
2015-01-23
Building, Testing

Building	This week I worked on fixing the gears on the spinner as well as fixing the intake device which was working incorrectly due to large amounts of friction. It went well. Everything we worked on this week now works and we made a lot of progress.
Testing	We tested out the new cardboard prototype of the tube as well as the ramp which we moved back, the intake device and spinner. At first it wasn't going well because the intake was not working as well as a wheel got disconnected, but as the week went on, we got everything working correctly.

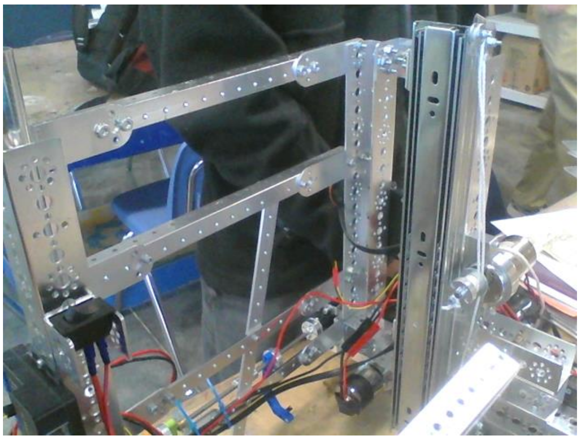
Testing

We tested a lot this week and were able to successfully fill the entire 90 centimeter tube with balls in just a few minutes. We also fixed a lot of problems we noticed including the intake and the wheels not working correctly.

Building

The first thing I did was replace the entire launcher/spinner because the gears were not going together well. There had been a lot of grinding from past testing and the competition. There was also some unnecessary friction. I rebuilt and replaced it to make sure all of it was in line and reduced the friction as much as possible. After that was completed, we realized that the intake was not working at all and a wheel had been disconnected. I replaced the wire which had a lot of strain on it to fix the wheel and then had to take apart the intake because a piece was grinding that we didn't notice when we had built it the first time. Ben moved the linear slides to the side of the robot so that we can move the ramp to the very back of the robot to prevent the spinner from hitting it.

Here is a picture of where we moved the linear slides to:



Alex Iverson
2015-01-26
Testing and Finalization

New Deflector	The new deflector is coming along well and is almost ready to be tested. The size and shape appear to be correct, but we won't know for sure until we see it work.
New Intake	The new intake is working nicely. It fully met the requirements of our strategy.
Guide Tube	The guide tube prototype is non-functional. It is not currently useful for basing a final polycarb build off of. It needs to be fixed and technical drawings need to be made in order to effectively fabricate the polycarb.

Our testing indicates that we should have greatly improved robot capabilities for our next tournament. (If we can manage to get the robot functional again in time.)

Matt Iverson
2015-01-27
Implementing the new deflector

We finished the new deflector, but there's nowhere to put it yet. We're also working on making the robot lighter and stronger.	David built a prototype for the guide tube made out of paper, but it wasn't strong enough. We've replaced the slide that extends the tube with a stronger, less damaged one.

My next task will most likely be either to find a way to mount the deflector or help David build the guide tube. We also need to start worrying about making our robot pass inspection, since our next tournament is coming up soon.

Filip Lewulis
2015-01-28
Construction

Linear Slide	Today was not a very productive day. Our other teams were practicing on the field, and we spent an unreasonable amount of time rescrewing the slide pulleys (to add a protective plastic for the string), launcher (whose design is still not square), and back-left wheel.

Unfortunately, the important components of the robot are structurally poor. The ramp has not been printed yet (though Alex is overtasked, so that's okay) and the guide tube is taped just as at the competition before it collapsed. Our friends' teams seem to be doing well though.

David Rohrbaugh
2015-01-30
Working on the Deployment of the Deflector

This week I did some more maintenance on the robot and helped the two other teams with their Samantha's, but I mostly worked on a deploying mechanism for the deflector.	As opposed to the deploying system for the previous competition, this deploying mechanism is motorized. A small metal beam is attached to a servo, which pushes the deflector up. Rubber bands take the deflector the rest of the way.

Here is a diagram of our deflector deployment system:

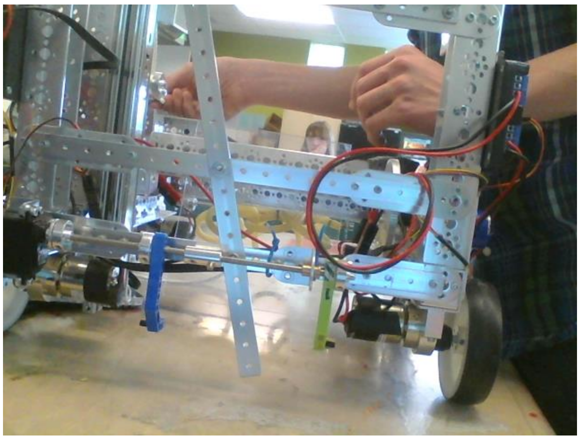
Nick Vosseteig
2015-01-30
Building

Building	Added support for the robot frame and the linear slides as well as a mechanism to flip the deflector up. We also did some minor repairs to the wiring. We also added a stopper so we can pull the goals without touching the tube. It all went well, but since the linear slides are moved to the other side of the robot we will have to rewire part of it to get the encoders attached correctly.

Building

This week I mainly worked on adding the support to the robot. The linear slides were pretty tough to work with because they were bent out of place because of the way it was built, so I added some support to it on the top and bottom so that it stays in line. I also had to take apart the back supports so that I could add the stopper to prevent the tube from hitting the robot while pulling/pushing it. I took apart the back and then moved the supports up and added another one to keep the frame sturdy. David and Philip worked on the mechanism to flip the deflector which is a servo with a long tetrix piece attached to it. The tube stopper is just a straight tetrix piece on the back of our robot that we needed to add because we moved the linear slides to the side and they acted as a stopper previously. It was tough to do because the holes on the support beams on the back of the robot didn't line up. I ended up putting it diagonally so that it would line up and it works well after testing.

Here is a picture of the tube stopper/pusher:



Matt Iverson
2015-02-03
Fabricating scorer tube

My brother and I spent about 3 hours Sunday night with our dad cutting the polycarb we're going to use to make the scorer tube. Last night, my brother and dad spent another 6 hours making it, but I had a basketball game so I couldn't help.	We got all the polycarb cut out, and are putting it together in class.

We had hoped that we would be able to cut the polycarb with a 90 degree drill bit so it would naturally fold into a 90 degree angle for the sides of the tube, but we couldn't make that work. We ended up having to cut out and glue all the rectangles together, which took much more time.

Filip Lewulis
2015-02-04
Testing

Testing	We've reattached the extending guide tube once more, connecting the drawer slide to the left side only. Our balls lose kinetic engergy immediately after entering because they hit the inside ledge, but we've met the size constraints. The NXT was a nuisance to attach, though.

The robot is in the same state as it was over winter break, but now formed more professionally out of polycarb. We have two days left to lift the deflector (via servo, not just hitting it).

David Rohrbaugh
2015-02-13
End of the Season (or so I thought)

This week I worked on our end-of-season PowerPoint and started working with Google Sketchup with the rest of the class, as, for all I knew, our season was over. Then, on Thursday (2/12), our coach, Mrs. Lannen, told us that she had just gotten an email saying that we had been invited to State, as there was one spot left.	It turns out that we had won the 3rd place Inspire Award, so we were up next up after the four teams that qualified for State on the day of the tournament. We were all very happy and immediately began discussing what needed to happen these next two weeks.

David Rohrbaugh
2015-02-25
Adjustments for the State Tournament

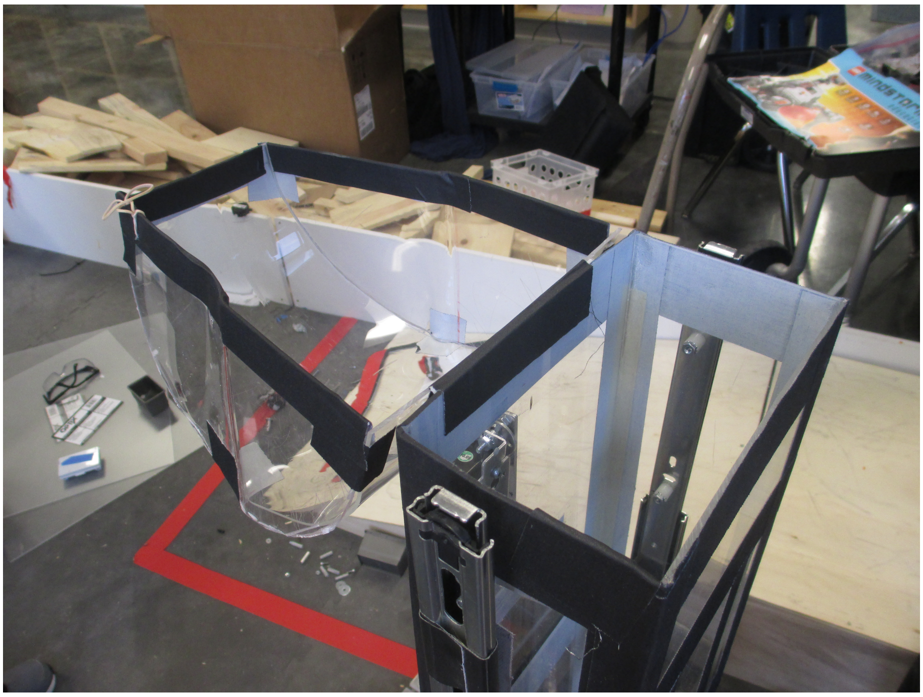
We ended the week of the 9th - 13th with discussing what needed to be done for the State tournament, so last week (16th - 20th) we started work on what needed to be done. We attached a second pair of linear slides on the other side of the guide tube to stabilize it, attached a second motor to the launcher to give it more power, and modified the LEGO pieces that make up our grabber mechanism. This week we have begun to test the robot and adjust things as needed. On Monday (2/23), we adjusted the range of our goal-grabbing servo and made our goal-grabbing mechanism more reliable. We are also working on a better autonomous. On Tuesday we continued work on these things.	Things are starting to come together. The robot is driving wirelessly again, the second pair of linear slides has indeed stabilized the guide tube, the second motor will give more power to the balls as intended, and our goal-grabbing mechanism is working much better than at the last qualifying tournament.

This is our robot design as of February 24th:

Here is a close-up of the new deflector:

It is still in a prototype stage, but Filip and Matt are working on a polycarb version.

Update 2015-02-26: Here is a picture of Filip and Matt's new deflector:



David Rohrbaugh
2015-03-06
Adjustments for the State Tournament

This week we created a list of everything that needed to happen before Super-Regionals, especially problems that needed to be fixed. We also became proficient in taking permanent marker off a whiteboard, as we started making the list with a permanent marker. More importantly we started building a test robot to test a new launcher design. It will be a cylinder of soft foam with a dense core in the middle to give it a lot of inertia. Standardized testing wreaked havoc on our schedule, and, as we meet in class, we did not get much done this week. Standardized testing also robbed us of our computers, which contributed to the lack of work that happened this week.	I am very excited to go to Super-Regionals. It will be a lot of work though. Hopefully we can make up the time we lost this week. Our shop is much cleaner now because Mrs. Lannen, our coach, organized a cleaning session one of the days that we were without laptops.

David Rohrbaugh
2015-03-15
Spring Break and the weeks before and after (3/9 - 3/27)

Week of 3/9	This week we tested different launching mechanisms with different materials to try to improve on the design we used for the State tournament. None of them worked very well consistently, and none were able to launch big balls as well as our previous design.
Week of 3/16	This week we decided to reattach our old launching mechanism as it was the best mechanism we had tested so far. The robot is coming together again as the Super-Regional tournament approaches. We also made about 470 buttons at FRC Team 4499 The Highlander's shop to distribute at the tournament.
Week of 3/23	This week we did final testing of our robot design and wrote a better autonomous on Monday and Tuesday. On Wednesday, we packed everything up. Thursday after school we flew to Oakland, California.

Here are some calculations we ran about our launching mechanism:

The big, middle, and small gears are running at 120, 360, and 720 rpm, respectively. The diameter of our polycarb launcher is 11.75 in. Therefore we can find the circumference with the following calculation:

$C = \pi d = 11.75\pi = 36.914$ in

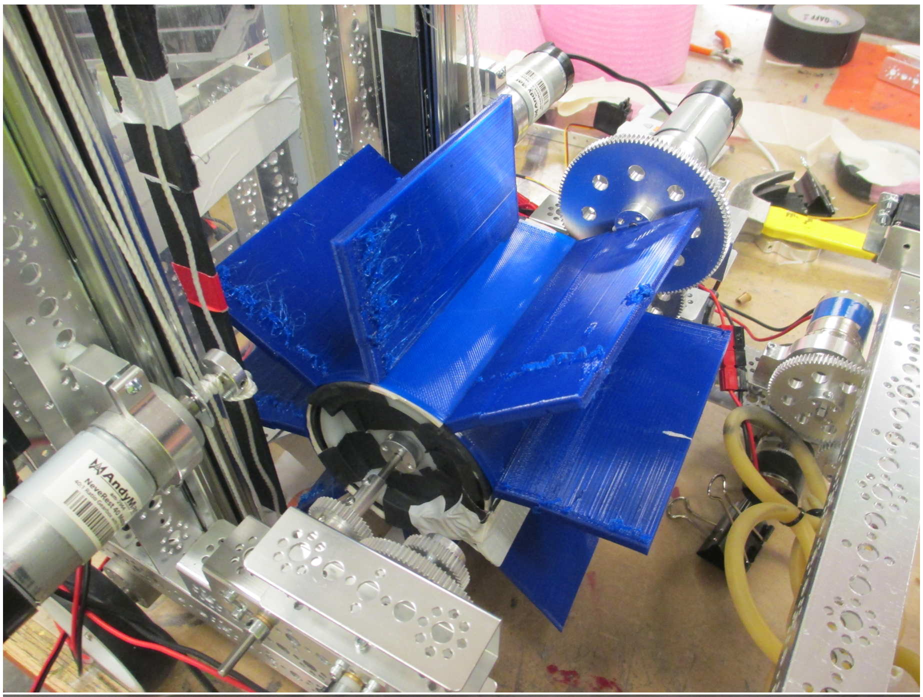
The launcher is spinning at 720 rpm, so it sweeps out 36.914 in * 720 rpm, or 26577.8738 in/min. Converting this to mph gives 25.1684 mph.

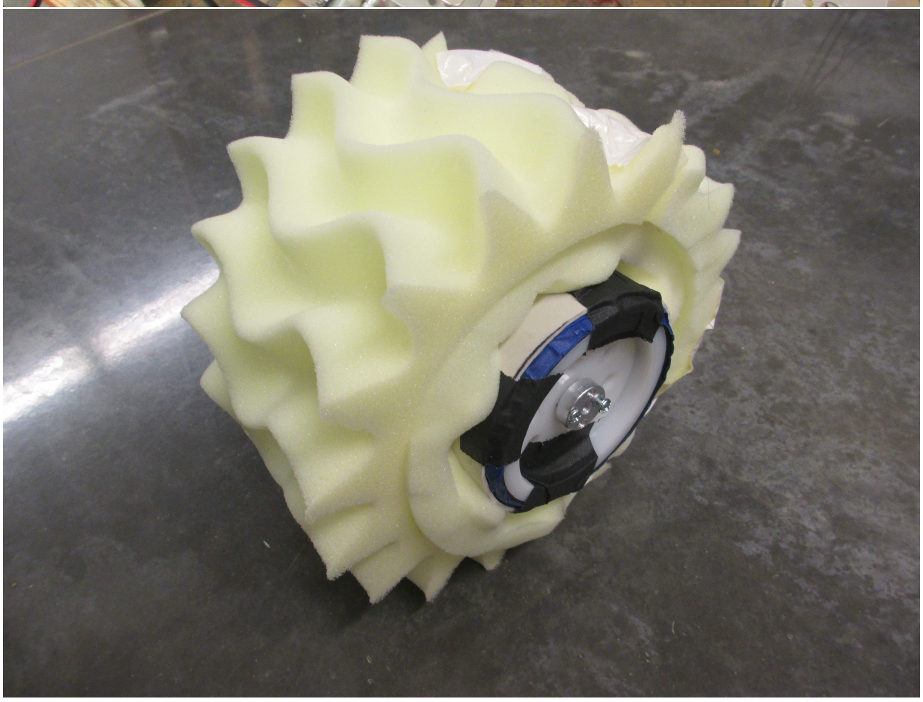
When we were working on our prototypes, we attached them to a wheel that had a diameter of 5 inches. It's circumference is

$C = \pi d = 5\pi = 15.708$ in

This wheel sweeps out 15.708 in * 720 rpm, or 11309.734 in/min. Converting this to mph gives 10.71 mph.

Here are some images of our launcher prototypes:





Oh yeah, and we somehow melted wood...

...four times.