Engineering Notebook

FTC 7347

October 3, 2014

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. Me, Nick, and Alex 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 demo'd 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

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 finalized on 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 deflected 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 Matthew were.

Promoting FIRST

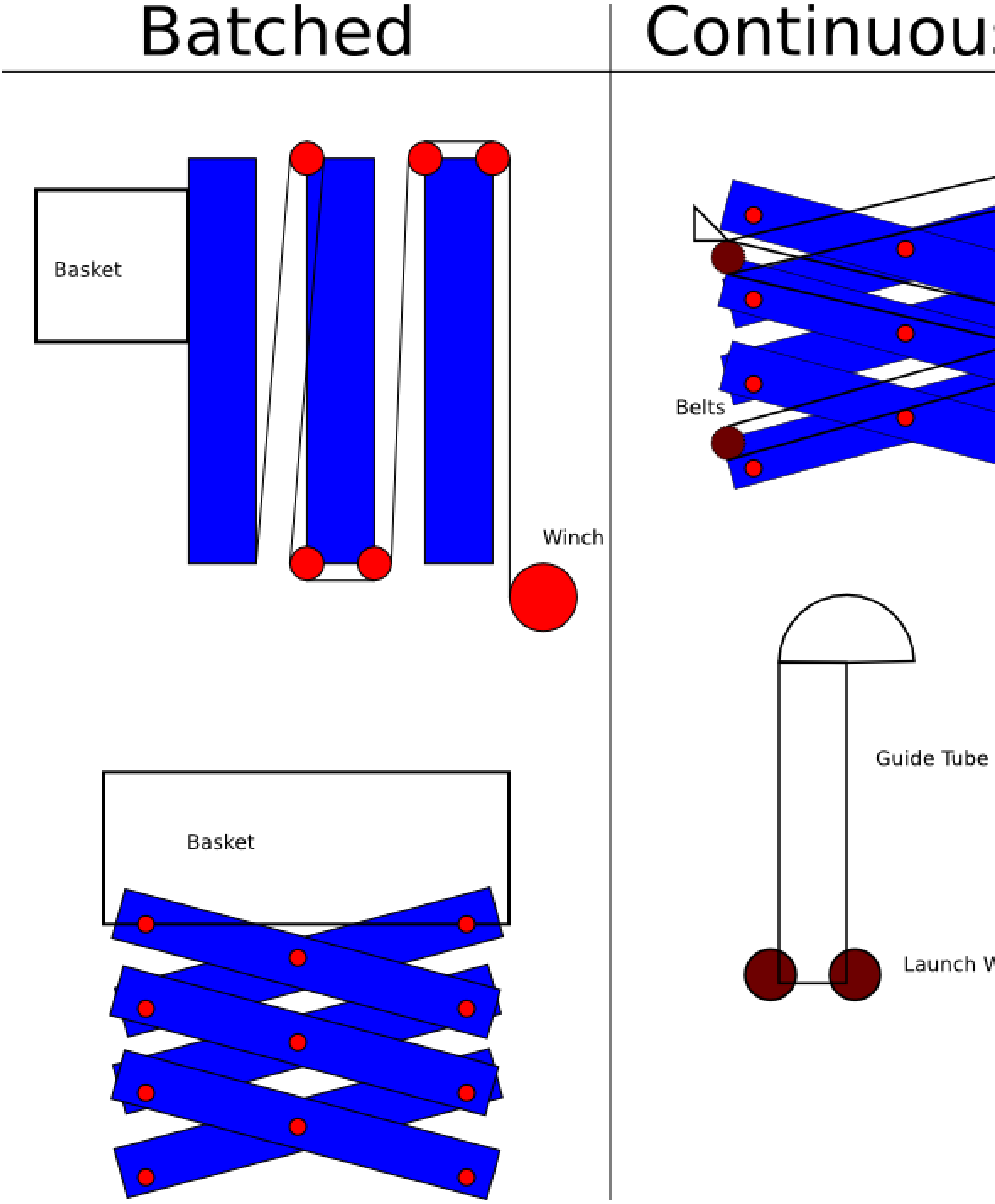
At the meeting put on by my FRC team our main goal was to get Lego Robotics coaches for the starting lego robotics program at Liberty. We want to get young students excited for robotics

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.

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 LaTeX for 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 actual construction of the robot.