TEAM 4909

Billerica Bionics Week 2 1/17/16– 1/23/16

Week 2: Progressing Prototypes

In a world of options, you want to try them all. Or at least try and see if they work. That's where prototyping comes in. Last week, we brainstormed many different ideas for getting the ball into the robot and then getting some way to propel it out of it. This week, we put them to the test.

Our Computer Aided Design members were hard at work over last week and this to get an idea of the real estate we would be dealing with on the robot. They took into account our wheel choice, the space required for all of the mounting hardware, a C-shaped cutout to help intake the ball, in addition to holding requirements to mount bumpers. After all of that was set and done, our prototyping had measurements and clearances to work with.

First on the chopping block were shooter designs. There were three in mind at the beginning of the week: spring power, pneumatic power, and wheel power.

A spring powered shooter would have some sort of compressing spring that would be released to shoot a ball, and would have some sort of powered pulley and ratchet system to charge the spring again. Unfortunately, a three foot long spring isn't something we have kicking around the shop. Spring team tried out some sort of surgical-tubing catapult design, but it never came to fruition.

Pneumatic power uses compressed air stored in tanks and releases it to obtain a linear motion. For a shooter, this would mean having some sort of piston that 'punches' a ball to shoot it. Pneumatic team first tried to have the ball sit on a tee and have the piston strike it, but we found that the piston was fast, but not fast enough to deliver the desired impulse to strike the ball. Even after creating a haphazard 'barrel' to keep the piston in contact with the ball longer, the results were still lackluster. (Continued on Next Page)

Team Hard at Work in Investigating Prototypes

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Game Information

FIRST Website

PTC Creo

Game Animation

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Week 2: Progressing Prototypes Continued

Last up was a wheel-based shooter. There were a few ideas rolling around, but we settled on having a single powered wheel, feeding the ball up through the bottom, and a ramp to keep the ball in contact with the wheel to guide it to the desired shooting angle. After some initial hiccups getting the plastic panel to stay in a curved shape, the shooter proved quite satisfactory, and was a sufficient proof of concept to get a unanimous approval from the whole team.

After a shooter was chosen, the next step was to get some sort of mechanism to get the ball into the frame of the robot. Again, the preference was set on wheels, and there were two ideas floating around. The first one was to have a bar of horizontal powered wheels on the edge of a pivoting square frame that would pivot down to contact the ball and roll it into the frame. The other was to have arms in a V-shape with powered wheels on the end, where the ball will contact one of the wheels and is funneled into the frame. Both designs are making good progress, and by either the end of this week or sometime next we'll have a shooter and intake to CAD up, then all that's left is to get a feeder mechanism to mesh the two systems up and then to start building. It's an exciting time for engineering, indeed.

UPCOMING EVENTS

Stop Build Season Day

2/23/16 at 11:59 p.m.

Billerica Memorial High School

35 River Street Billerica, MA 01821

Reading Competition

3/11/2016 - 3/13/201

Reading High School

62 Oakland Road
Reading, MA 01867

Wheels, Wheels, Wheels

In the world of FIRST robotics, wheels are your best friend. From locomotion to intakes to shooters, wheels by far are the most versatile and useful component on any robot. The nice part about them is that they come in many different sizes, treads, and structures.

Something that we have to keep in mind this year, is that opposed to previous years, we have to actively traverse obstacles in order to complete objectives. Not only do we have to take into consideration the clearance to get over or under obstacles, but also the forces at play when driving into or over defenses. For, say, opening the drawbridge and driving over the panel it may not be an issue, but for the rock wall (an obstacle that is a 4" by 4" by 3' beam), the chassis and wheels are going to take a serious beating going over.

When it comes to wheels, we determined two main groups. Either you have some sort of mini-bike wheel that has an inflated inner tube (pneumatic), or, you have some sort of solid framed wheel with a solid rubber tread. We weighed the advantage of pneumatic wheels being able to cushion impacts and having a flexible frame against tread wheels ability to be replaced easily but also more easily fractured. We determined that although pneumatic wheels were able to cushion impacts, their bounciness also made them more unruly and unpredictable in going over defenses. As a result, we determined to have tread wheels with a solid frame and a replaceable outer tread to be our wheels of choice .

Plastic Wheels With Replaceable Treads

Prototypers Testing Out Wheel Options

Tires For Pneumatic Wheels

Team 4909 at the MMS's FIRST Tech Challenge Competition

The Marshall's FTC Competing in a RES-Q Match

FIRST Tech Challenge With the Marshall Middle School

This year, we founded a FIRST Tech Challenge (FTC) team at the Marshall Middle School after the popularity of their robotics club last year. On Mondays and Wednesdays, we send a few team members there to guide them in whatever their challenges may be: brainstorming, building, programming, fundraising, and anything else that might need to get done.

Team 10692 Driving Their Robot

In the beginning, the Marshall team didn't have any prior experience with FIRST, so right away, we taught them about the program and what they would be doing. When the FTC game was released in September, the team broke down the game (FIRST RES-Q) and decided on a strategy that could score a good amount of points while also being simple enough for a rookie team to build. The team then broke up into sub-teams, much like how we break down our FRC tasks. Each sub-team is responsible to work on the separate components of the robot: programming, building, fundraising, and more. After a few months of building and testing, the team was ready to compete at their first event.

A few members of our team attended their competition to assist in their preparations and also to watch the game. Once they were all set up, we proudly watched as they rose up the event rankings and ended the qualification rounds in 4th place (of 12). Once the elimination rounds began, the Marshall team was paired with the 2nd ranked team, and they made their way into the final round. After the first 2 matches, the teams were tied 1 to 1 with their opponent-one victory a piece. The third and tiebreaking match was very close and well-played by both teams, and the Marshall fell just short of winning the event. Their success on the field was very impressive for a rookie team at their first ever event and they continued to impress at the awards ceremony.

It was there that they not only got an award for being finalists, but they also received the Motivate Award, which according to FIRST is given to the team that…

> "Exemplifies the essence of the FIRST Tech Challenge competition through Team building, Team spirit and exhibited enthusiasm. This Team embraces the culture of FIRST and clearly demonstrates what it means to be a Team. This is a Team who makes a collective effort to make FIRST known throughout their school and community, and sparks others to embrace the culture of FIRST".

Overall, the Bionics are very happy with the first year of the Marshall FTC team, and we're looking forward to guiding them to success in the future.

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