Spring 2017 Volume 20

Monkey Business

News of the Lynbrook High School Robotics "Funky Monkeys," *FIRST*® Team 846

Table of Contents

Upcoming Events

Summer 2017
Worksessions (in Room 612)
Fall 2017
Chezy Champs (at Bellarmine HS)
CalGames – Hosted at ????

Punk Monkey

Learn about the different parts of our 2017 robot on page 3!

An April Fool's Joke

The day our team became the "Banana Breakers"

Nikash Walia (*sophomore*)

April Fool's Day- a day when 5th graders come up with silly jokes and Google plants a plethora of subtle pranks across their features. April Fool's Day- the one day when pranks are acceptable, and more than often, welcome.

Our team wanted to do something unique this year. As we were analyzing the gameplay strategy and robot features of team 1678, the Citrus Circuits, two of us, Shikhar Jagadeesh and James Jiao had a lightbulb moment for April Fool's, and we realized maybe it was time to start fresh with a new FRC team- the Banana Breakers.

Our main graphic designer, Elton

see **AN APRIL FOOL'S JOKE**, *Page 2*

FIRST Regional Experience

A freshman's experience on the team and at the Utah Regional

Rin Ha (*freshman*)

Ever since I started having group projects in sixth grade, my experiences with them were often one-man projects. My understanding of being part of a team and cooperating was miniscule and hazy until I joined Robotics. Thanks to Team 846, I started to learn what teamwork truly is, and at my first regional, the 2017 Utah Regional, I could finally see its importance clearly.

Coming to my first regional, I was exhilarated knowing it would be a thrilling experience, but also slightly apprehensive due to the fact that our robot was not complete with some subsystems absent. Despite the worries the entire team had, everyone in the pits was giving their all to finish the robot. They worked industriously for several hours straight and with each other's assistance, completed the robot. After passing inspection, we were finally able to see our robot in action, and we all silently hoped for a good performance in our final practice match. Unfortunately, due to a clash with an opponent, a crucial part of our gear collector had been bent, and the

see **FIRST REGIONAL EXPERIENCE**, *Page 2*

The Engineering Process

Using the scientific method to debug a software issue

Philip Axelrod (*junior*)

This year's game, which involves shooting whiffle balls, offered a unique challenge for both the design and the software team. After creating an ingenious double belted shooter, which was noticed by many teams and even won the Innovation in Control Award, it was time for the software team to step in and create matching software for the meticulously designed hardware. In the process, not only did we create a novel shooter, but the software team practiced the engineering cycle.

On the first iteration of the shooter software, we noticed that balls were being shot inconsistently. To help diagnose the

see **THE ENGINEERING PROCESS**, *Page 2*

An April Fool's Joke Continued...

Chang, made it his mission to give this idea concept and designed a brand image as a parody of 1678's classic logo, except instead of a lemon with embedded circuits, he used a banana with wires extending outwards. Initially, people did not demonstrate much interest in the idea, but as conversation within the team continued during competition season, the plan picked up momentum and soon, we had many team members buying shirts.

Saturday, April 1st occurred on Day 3 of the Silicon Valley Regional. The team had been working from morning to night in the pits and scouting other teams, as well as balancing missed work from school. Then a group of students showed up in grey shirts with strange logos that read, "Banana Breakers Team 864". Everyone was surprised and intrigued to see a team that had never been heard of before, much less registered to compete at the Silicon Valley Regional. The humorous play on one of the world's most competitive teams, at one of the world's most cutthroat events was a comic relief for the load on all the teams at San Jose State University. But the most iconic moment of the April Fool's was yet to come-- while picking teams for elimination matches, the event announcer, confused by our team's two different shirts, called us "Team 864" instead of "Team 846", prompting laughter from the entire team, as well as those who were acquainted with our friendly prank.

Our little joke may not have been as iconic and well-known as Google's "Easter eggs", but it remained immortalized and memorable as our own April Fool's joke forever in our hearts and minds.

"Quote"

FIRST Regional Experience Continued...

team had to find a way to repair the vital subsystem. With synergy, our robot was mended and prepared for its first qualification match on Friday.

The first qualification match was a rough terrain, but after passing it, our robot performed well overall throughout the rest of the qualification matches, with some unfulfilling ones and some quality ones. To my pleasant surprise, we had a superb performance in our final qualification match on Friday where we earned an amazing 305 points with our alliance. The day ended on a high note, and I was inspirited for the last day.

Saturday started off with more qualification matches, and they continued all morning. Once they had finished, it was time for alliance selections. When it was time for the second-ranked team to choose their first alliance partner, they selected us. Our team roared in excitement and we were thrilled to compete in elimination matches and be chosen by a great team. In our quarterfinal matches, our alliance claimed victory both times, even earning 306 points in one match, and we headed to the semifinals. Although we could not advance to the finals, our alliance tried our best in our semifinal matches.

Later during the award ceremony, we learned we won the Innovation in Control award, our Vice President of Software Engineering, Shadaj Laddad, won Dean's List Finalist Award, and our mentor, Mr. Giandomenico, won the Woodie Flowers Finalist Award. The Innovation in Control award made me particularly elated because I knew that the software team's contributions, including mine, helped us receive that award. It was also great to see Shadaj become a Dean's List Finalist since he had done so much for the team and personally had been a student mentor to me throughout this year. Finally, seeing our team mentor, who has taught our team for fourteen years and been a central figure in unifying us, earn the Woodie Flowers Finalist Award was thrilling.

As our team was cheering together for the great success we had at the regional, I could feel the spirit of teamwork. Cooperation allowed us to reach such a high level of performance. By going to the 2017 Utah Regional, I now know that teamwork is a key factor to any team's success rather than members only focusing on their own work. From what I have learned, I am even more enthusiastic to contribute to Team 846 and work together with the people in the team!

The Engineering Process Continued...

issue, we logged the speeds of the shooter rollers to analyze. After looking at our data, we were surprised to find that the roller speeds wildly oscillated around the target speed, which would explain inconsistent shooting. After making the control of the roller speeds less aggressive, we found that shooting did become more consistent. This was the first of many iterations the software team worked on to get the code working just right.

A second issue soon arose. Although balls were being shot consistently, we found that balls were still falling short of their target. This called for a second iteration of the shooter software. To diagnose the problem, the software team logged the roller speeds again. Much to our chagrin, we discovered that approximately one second after the shooter achieved its target speed, the speed decreased by almost 3 percent, and never recovered. This explained why balls were not traveling as far they should be, because they were being shot at too slow speeds. The software team was suspicious that this speed decrease was caused by voltage drops, possibly due to the collector being turned on. Sure enough, logging battery voltage showed that around the time of the speed decrease, the battery voltage dropped as well. After coming up with a scheme to compensate for this dropping battery voltage by increasing motor outputs accordingly, we tested this on the robot and logged the data again. Success! Not only did the data indicate the elimination of the velocity drop corresponding to the velocity drop, but the results were visible in that balls were being shot consistent distances! We accomplished more than consistent shooter control.

In fact, our entire robotics club is about more than shooters, control software, or robots. Rather, the shooter was medium for students to participate in the cyclic engineering design process: We made educated, evidence-based observations to diagnose problems regarding shooter speeds; designed, implemented, and tested solutions based off these observations; and repeated the engineering cycle to address increasingly more difficult problems. The students walked away from this experience not only with a competitive shooter, but with the engineering process as a problem-solving tool. Alumni will graduate with four years of practical problem solving experience that give them a competitive edge in leading the quest to solve tomorrow's STEM problems.

Punk Monkey

Height: 24 in. | Length: 28 in. | Width: 28 in. | Weight: 88 lbs.

The 2017 challenge for thousands of FIRST robotics teams this year is "Steamworks." During the first fifteen seconds, alliances composed of three teams use pre-coded instructions to score points. In the tele-operational period, lasting two minutes and fifteen seconds, two alliances place gears on their airships and score fuel into the boiler. Gears are used to power up to four rotors on the alliance's airships. During the last fifteen seconds of the match, alliances climb ropes dropped from their airships.

Climber

Shooter

Collector

Gear Collector

Drivetrain

Collector

Our collector uses belts to pick up balls from the ground and move them to the ball storage. It also serves as an elevator that lifts balls from the ball storage up to the shooter. A pair of pneumatics deploys the front of the collector outside the robot's bumpers to collect balls before the robot runs into them.

Gear Collector

Our gear collector uses a pair of clamping surfaces to pick up gears from the ground. It uses a pair of pneumatic cylinders to raise and lower itself, and another pair to open and close the clamp. It uses a linear slide to ensure the clamps slide smoothly, as well as using special friction surfaces to grip the gear as the robot lifts it off the ground.

Climber

Our climber uses Velcro to capture the ⅜" nylon rope. A slip knot in the rope allows the climber to gather enough slack before climbing. The gearbox includes a torque limiter that slips when the robot reaches the top of its climb. A ratchet on the output prevents the robot from falling. It takes around eight seconds to capture the rope and climb.

Shooter

This year we tried something new with our shooter, designing a double-sided belt shooter that would pivot to shoot from different angles. From our calculations we found that a belt shooter could transfer more energy into balls while still maintaining a lower profile when compared to the standard single flywheel hooded design. Another requirement was to shoot from the two walls adjacent to the boiler, to provide a location for shooting fuel safely into the high goal. We realized that a turret would need to rotate 150 degrees to meet this standard, so instead, we designed a flip shooter that would have two positions for shooting.

Drivetrain

This year's drivetrain is a slight variation of our Funky Drive from 2014. It was also fully designed, machined, and assembled by a group of girls on our team who took part in the "Girl's Subsystem Challenge." This six-wheel drive has a slight center drop on the middle wheel, making it a west coast drive. The front wheels are omni wheels, which reduces turning resistance, and the center wheels are traction wheels, which allows for control. The drive gearbox has motors that hang over the to save space for electronics on the interior. The single speed gearbox can drive the robot up to 15.5 ft/s.

Senior Goodbyes

Dear Funky Monkeys,

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Our little joke may not have been as

Dear Team,

As my time on the team comes to an end, I look back on the past three years with a sense of accomplishment and awe. I remember on Kickoff day of my rookie season, I still thought it was impossible to make a robot in six weeks. Now, I've helped build three. That first week, I stood by the CNC both intrigued and confused. Now, I can use that same machine to fabricate complicated parts.

When I joined the team, I immediately started participating in the Girls Subsystem, which was only in its second year. It enabled me to develop skills strong enough to become one of the team's first technical leads. Today, the team consistently has six or seven girls working on the drivetrain, a significant rise from the two during my rookie year. This project enabled me to become an active member on the team, and I'm sure it will continue to do the same for many other girls in the future.

A word of advice to new members. Our team prides itself for its diverse membership. Our skill sets range from writing and public speaking to animation and music. Regardless of what you may be interested in, you will find a way to express that passion through some activity on the team. As long as you remain active and open-minded, nobody will stop you. And, if there's something you want to do but nobody else is doing it, start it yourself! Want to build a skateboard? Or apply for a new grant from a sponsor? Or even share your knowledge with the world? You can do any of those things (in fact, those are all activities that students have led and accomplished).

Thank you to all the mentors and members who patiently guided me through my time in Robotics. This team has transformed me from that shy sophomore to a confident leader. I will never forget the lessons I learned, the friendships I have formed, and memories that will last a lifetime. I know Lynbrook Robotics can only go up from here, and I can't wait to see what the team accomplishes in the future.

– Ria Pradeep
2016-2017 Co-President

Where Can You Find the Class of 2017?