Fall 2018 Volume 23

Monkey Business

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

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How Robotics has Impacted Me

One student's take on being a Funky Monkey

Isha Venkatesh (soph.)

Walking into the robotics workshop for the first time, it was hard for me to imagine that an entire robot could be made using just the tools in that small room. As a rookie member, I knew that the robot was built from scratch, but I still couldn't picture how until I

Isha Venkatesh soldering a sensor.

see **The Impact of Robotics**, *Page 2*

Presidents' Welcomes

Andrew Ng (sr.)

Calling all robot fanatics!
Are you ready to make 120 pounds of aluminum come to life? At Lynbrook Robotics, we bring people who love robots together. Whether you are interested in programming, mechanical design, art, or writing, you can join in on the fun.

If you want to help build robots but don't know where to start, don't worry. When I was a freshman, I was unsure what interested me, so I participated our team's fall workshops. Each workshop got me up to speed on the basics of one aspect of robotics. From there, I found what I had the most fun doing, and have never stopped since. Whether or not you know what you want to do, remember not to restrict yourself to just one area. Just jump in and learn something new!

The past three years on this team have been extremely satisfying for me. I look forward to meeting you and hope your robotics experience will be just as rewarding as mine.

- Andrew Ng, Co-President 2018-2019

Presidents Andrew Ng and James Jiao.

James Jiao (sr.)

Hi future Funky Monkeys,
Get ready for an exciting year of designing robots, machining parts with aluminum, and programming at Lynbrook Robotics! With business plans to graphic art and journalism, Lynbrook Robotics emcompasses a variety of activities outside of building robots.

If you're worried about lacking the knowledge needed to build a 120 pound functioning robot— don't be! During the build season in January, as we get our hands dirty with creating the robot, feel free to ask questions and be pro-

see **James' Welcome**, *Page 2*

Competing at FIRST Championships

Recapping our most successful season to date

Eesha Deepak (sr.), Aayush Shah (sr.)

Hundreds of robots. Five thousand cheering students, mentors, and volunteers. One trophy.

The FIRST Robotics Competition Championship in Houston, Texas was a new experience for our team. Competing against and allying with teams from China to Israel to New Mexico, we marveled at the diversity of robot designs all built to play the same game and achieve the same goal.

This year, the game challenged us to deliver "power cubes" to levers called the scale and the switch, trying to tilt each to their respective side. Quick and agile robots specialized in two-sided intakes that worked on both sides of the robot to deposit onto the switch, while others designed lifts that rapidly ascended and descended for placement on the high scale. Others still combined both of these to make powerhouses that enabled more proficient autonomous modes. Our decision to pursue a "scaling robot" design provided us with versatility and enabled us to dominate on the field with an adaptable strategy.

With an experienced strategy team talking to

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Competing at Champs *Continued...*

other teams, we often saw the many different types approaches teams took for their strategy and designs. Hundreds of robot types, play styles, and sets of capabilities meant that each match, we would scramble in the pits, find our teammates, gather information about our opponents, and create a completely new game plan. Some teams specialized in defense, spending matches obstructing their opponents using strong drivetrains and quick driving. Playing against these robots was always nerve-wracking, having to escape the hold of our opponents and create new strategies on the spot.

Elton Chang (grad), Eesha Deepak (sr.), Jing-Chen Peng (grad), and Aayush Shah (sr.) driving our robot at the FIRST National Championships in Houston, Texas.

Perhaps the most amazing aspect of championships was the accuracy of autonomous modes, which played a prominent role this year. During the autonomous period, the first fifteen seconds of the match, robots scored points without any human assistance. Whenever resting from matches, robot maintenance, strategy discussions, and practice, we sat in the bleachers and watched powerhouse teams place multiple cubes in the switch and scale autonomously. The shifting goal locations and starting positions in this period posed an especially significant obstacle; however, our software team rose to the challenge with a well-tuned, easily configurable setup. When planning strategy in our alliance, we always ensured that our three robots could collectively score the maximum number of cubes during this period.

The 2018 season marked our best season in history. We won the Hub City Regional, were finalists at the Silicon Valley Regional, and were ranked fifth in the Galileo Division at Championships. Our success was the outcome of the high performance of our robot meshed with our strategy to prioritize certain tasks on the field. A high-caliber team composed of scouts that gathered data for our strategy heads to analyze, a pit crew that cranked out repairs in record time, and a drive team that made split-second decisions to win us matches enabled us to go further than we ever have in 17 years of Lynbrook Robotics.

The Impact of Robotics *Continued...*

experienced build season firsthand.

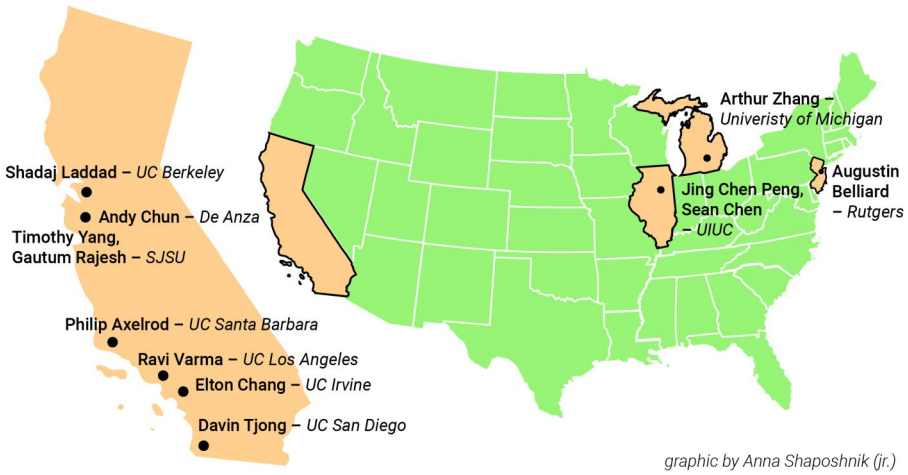
Before being able to contribute during build season, I needed to attend workshops. Entering robotics unsure of my interests, I went to the design, electrical, and machining workshops. Although I enjoyed them all, I decided to contribute to the electrical subsystem because I felt a sense of accomplishment in being part of what powers the robot.

During build season, we poured several hours a day to build a robot that we could all be proud of. Workshops had given me a solid foundation, teaching me how to crimp, strip, and connect wires, but when there was something new to do, I looked over the electrical leads' shoulders to try and learn from what they were doing. Workshops were a great introduction to build season, but nothing could compare to the tasks we completed during those six weeks. Once, I spent an entire worksession soldering wires. At the end, I was tired of the smell of solder, but I felt I could solder in my sleep! Listening to the robot hum as we powered it on for the first time was a proud moment for me. Build season allowed me to work firsthand on the robot and gain knowledge I lacked as a rookie.

All our hard work was put to the test when our robot competed at the competitions. I was amazed to see the various robot designs. Although we all played the same game, no two robots were the same. I remember watching tall robots speed up, holding my breath, afraid that they might tip over. Every time a robot did tip over, the entire crowd "awed" in sympathy for the team.

Looking back to the first time I walked into the robotics workshop, I never would have guessed that in a year, I would have transformed from a rookie freshman to a veteran member. The countless hours spent, spicy falafels eaten, laughs shared, and challenges overcome produce memories to last a lifetime. From fun team bonding events to the busy weeks of build season, robotics has provided opportunities for me to to learn new skills, meet new people, and most importantly, become a part of a team that contributes to a great high school experience.

Where can you find the Class of 2018?



graphic by Anna Shaposhnik (jr.)

James' Welcome *Continued...*

active by helping out with whichever aspect of the robot interests you. When I was a freshman, I approached one of the senior designers, Owen, who helped me with my first project designing the shooter hood. Don't be afraid to talk to us upperclassmen, we'll be more than happy to help you get started. After all, we were once freshmen too! Build season is a stressful six weeks, but as long as you manage your time well, I can assure you it'll be a great experience.

These past few years on the team have been both rewarding and enjoyable, and I'm glad I decided to join the team when I was a freshman. I hope you too will find your place on this team, and I look forward to seeing you around!

-James Jiao, Co-President 2018-2019

15 Years a Mentor: Mr. G's Story Inside Robotics

The insights of one man who has been teaching and inspiring us for a decade and a half

Nikash Walia (sr.)

David Giandomenico, or Mr. G as he we call him on our team, has been a mentor on our team for fifteen years. During this time, Mr. G has guided team members in robots, helped run training workshops for new members, and assisted in establishing relationships with corporate sponsors, to name just a few of the ways Mr. G has guided our team's path to success.

What is your favorite robot name?

I would have to say that the best one is definitely Funk Cannon. It was short, punchy, and you could tell it worked because the announcers were shouting, "Here comes the Funk Cannon!", and you'd never hear the announcers say any of our other

"Here comes the Funk Cannon!"

robot names that way. Without a doubt, it got people's attention; it was good.

How are current robotics students different as compared to 15 years ago?

I suppose the biggest thing is...they're involved, actively involved in the design, more than in the early years, and I think for those reasons, they gain a lot more out of the program. In some senses, in the beginnings, it was more of a club. Sometimes the students would disappear while building the

"You learn a little bit by watching, but you learn a whole lot more by doing."

robots and go have hamburgers or something. You don't see that much of that now. The group is much more dedicated. You're still high-school students. I suppose part of it is that there's more expectations on the students now as compared to when I first joined, and they really rise to those expectations.

Team Coach, David Giandomenico.

The Girls' Subsystem is one of our flagship programs but also one of our most controversial. What are your reasons for maintaining it?

Well, you know, this past weekend, we had a CAD workshop for teams around the Bay Area through the Tesseract Program. I had a couple of mentors approach me on how to get girls more involved. My own experience is the girls, while we have 30% on the team, they tend towards the administrative roles. I feel it's a little bit safer. You don't have to defend your designs, and it's just really hard to make that jump if you're the only one. So really the idea behind the Girls' Subsystem is to create a comfortable environment where you're joined by other girls who all want to do design work. I think it's proved to be very effective and it's continuing of course because it's not a feat accomplished. Every year we have more guys than girls in the program, and so this will just be a continuing program where we really help them come into the mainstream. It's going to take many years before that changes.

At Lynbrook Robotics, students often explore topics that are completely new to them. In your experience, what is the best way to teach a student about a topic he/she has never heard about?

To me, the best way to teach something that is unfamiliar is to do it by example. It's very easy to do just do something yourself and have the students watch. Instead.... if it's a computer, I might show somebody how to do it and then put them in the driver seat and I sit next to them and guide them through it, and it's the same thing with the machinery area more than anything else. You learn a little bit by watching, but you learn a whole lot more by doing. I really do a lot of stepping back to let people learn...Another situation is where a student is designing something is not the tried and true design. I'll often let them explore that rather than impose my ideas on how it should be done so that they can see.

"I really do a lot of stepping back to let people learn."

But I'll only do that if the thing has a chance; if it's never going to work, you need to figure out how to direct the student in the right direction in a way that will yield a positive result, or at least a mostly positive one.

You've been on the team for the past 15 years. How will Lynbrook Robotics be relevant in the future 15 years?

Well, I would say that the point at which it is no longer relevant would be at the time when program such as this are routine in public high schools. At this stage, it's difficult to incorporate it into institutional learning and what I mean by that is when we learn something like math, everyone learns to do something in the exact same way, and that's an efficient way to bring up a large group of people. When you look at a program like a robotics project, it's so diverse, it'd really be hard to make a class out of it that everybody could follow. So, in that sense, I don't really see it moving out of the extracurricular model for some time. I guess what is especially difficult however is this struggle for funding…Right now, we're like a football team who practices in the classroom, and then we go to an event and somehow expect to be effective competing. We really need to make this on the level of a sporting event, wide-spread, across schools, and then I think we'll see a huge jump in how effective we are at training and educating students in engineering.

Mr. G devotes countless hours of his own time to turn confused freshmen into proficient programmers, machinists, and designers. He is always providing us with careful insights that can make a great difference; during offseason, he can be found frequently giving elaborate talks on a high-level concept, beginning from the ground up to ensure comprehension. Every time I meet him, be it during a lunch meeting or during the final stretch of build season, he will always greet me with a "Hey Nikash, how's it going?" and a warm smile.

What's Kotlin?

How our software team continues to evolve

Kunal Sheth (jr.)

Robotics is a place where students can evaluate risks and explore new ideas. This year, we chose to explore a new programming language in hopes of finding a platform that addresses all our goals. Besides the traditional languages, Java and C++, new and upcoming languages like Kotlin and Rust were also put on the table. We hosted an open-door meeting to evaluate our language candidates based on our team's goals: to enable students to explore engineering, to build a 'kick-ass' robot, and to explore new ideas.

Our team started by agreeing that, while Scala took us in a direction unique to all of

Timothy Yang (grad) and Kunal Sheth (jr.) test out the robot's control code.

FRC, it made robot programming almost inaccessible to incoming members; maintenance is further hindered by its lack of support by FIRST tooling.

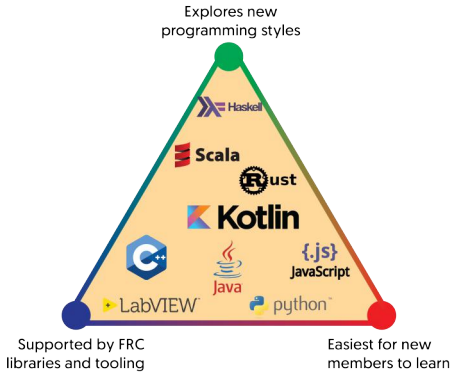
We had created and prioritized a list of criteria to help structure our decision: a language's barrier to entry, existing FRC support, and quality of tooling to be of the highest importance, followed by more technical features like compile-time safety and syntax cleanliness.

"Robotics is a place where students can evaluate risks and explore new ideas."

We moved on to evaluate Java, C++, and Kotlin, using Java as a baseline because Java is the most commonly known amongst our members. By comparison, C++ had a higher barrier to entry and didn't guarantee as many safeties; despite advantages such as support for real-time programming, no student was confident enough to lead the team in it.

Another option was to stick with Java. We know Java works; our team has used it before. However, as a team, we take risks and try new things. Although Java works well enough, a different approach could work even better; even if it wasn't as successful, we would have learned more along the way.

After a few hours of discussion, 16 out of 18 attending students voted to use Kotlin. Unlike Java and C++, Kotlin is not officially supported by FIRST. However, we can still use official FRC build tools and libraries because Kotlin is 100% compatible



with Java.

Kotlin was created to be a practical alternative to Java. It is not a research language. Instead, Kotlin helps programmers solve real-world problems using time-tested features already found in other languages.

My favorite part about Kotlin is that it allows new team members to get started quickly while also serving as a gateway to more advanced concepts such as functional programming. Kotlin's widespread adoption amongst Android developers has created numerous high-quality resources for new members. Then, after learning the basics, Kotlin's superior IDE support continues to guide students in writing more idiomatic code.

Overall, Kotlin is promising. It is easy to learn, helps us write better code, and introduces us to more advanced programming concepts. With Kotlin, we are constantly finding new ways to improve, and I can't wait to see what else we can do with it in the coming seasons.

Upcoming Events!

Sep 15
Fall Festival
Cupertino Memorial Park

Sep 19
Parent Meeting
7:30 pm Auditorium

Sep 24-28
Workshops Start
Afterschool Rm. 608

Sep 27-30
Chezy Champs
Bellarmine College Prep.

Sep 29
Open House
Intuitive Surgical Headquarters

Oct 5-6
CalGames
Woodside HighSchool

Dec
Winter Social
TBD

Jan
Kickoff
Build Season Begins!

Workshops

Mon - Machining
Tue - Animation
Wed - Design
- Media
Thu - Electrical
Fri - Software

Weekly Meetings

Team Meetings
every Tuesday
7-9pm @Room 608

Lunch Meetings
every Wednesday
@Room 608