



MONKEY BUSINESS



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

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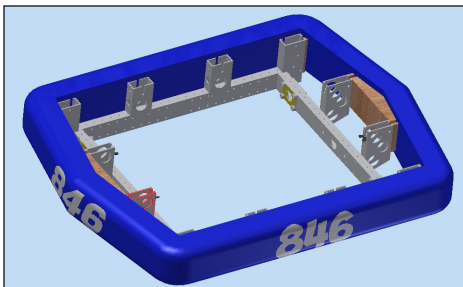
Upcoming Events

- January 3rd, 2015
- Build Season
- 6 full weeks of robot-building
- Kickoff Day
- What will be the next challenge for every FIRST Robotics team?

Hexagon Is The New Rectangle

The new bumpers drastically improved the 2014 robot's on-field performance.

Raphael Chang (*senior*)



Despite the results of our impressive 2014 competition season, our robot, Funk

see **HEXAGONAL BUMPERS**, Page 2

Inspiring the Next Generation

We host annual workshops for members leading up to the competition and build season.

Sean Meng (*sophomore*)

After the long school day ends, every day of the week new members of the Lynbrook Robotics team are seen making their way to the back corner of the school to Room 608. Here, students are in their desks, pulling out their laptops and getting their hands dirty in workshops which will ensure that all members of the team can become active participants. Standing at the front of the room, veteran members teach both the conceptual and practical knowledge in the complex field of robotics.

see **WORKSHOPS**, Page 2

Owning CalGames

Every year, Western Region Robotics Forum (WRRF) hosts an offseason competition known as CalGames

Owen Li (*junior*), Nikita Seth (*junior*)



Our entire alliance celebrates making it to the final rounds of CalGames.

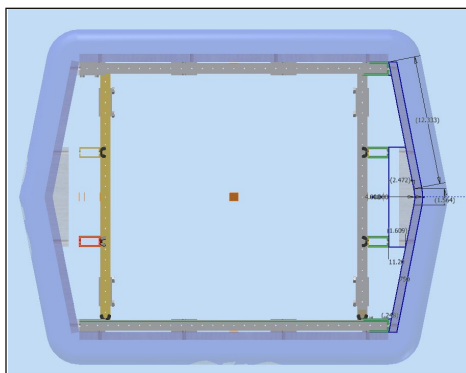
CalGames was the perfect way to end our 2014 season. Going into the Funk Cannon's final competition, the team knew we had to play our best to do well, and we did. Our team seeded second out of 38 teams after steamrolling the qualifications rounds with an impressive 9-1 win record. We joined the first seeded team, Team 971 Spartan Robotics and then selected Team 2489 The Insomniacs to complete our alliance. Our team won the quarterfinals and semifinals with ease, and reached the finals of CalGames for the first time in our team's history. We bested the second alliance in two consecutive matches to win the event, a fitting end to a season that began with our first ever regional competition win.

Not only did we win the competition, but we also won the CAD award for exceptionally implementing computer-aided design (CAD) in the team through CAD workshops and in the build season. The judges were impressed with our top-down approach to designing the robot and how we CAD-ed the whole electrical system on our robot. The judges were also deeply interested in our use of stress-analysis to

determine which parts of the robot were under the most strain, and appreciated the effort we spend in training new members to sustain and build up CAD knowledge for the future generation.

In addition to winning the competition and receiving the CAD award, our team had roles in preparing and running the CalGames event. As Publicity and Social Media Lead for the Western Region Robotics Forum (WRRF), Nikita Seth worked on getting more press coverage of the event, encouraging people from local news stations and newspapers to attend the event. She also discussed plans for CalGames and issues from past years to improve upon with other FIRST teams. Our head mentor David Giandomenico played an integral part in electronically scoring matches. Furthermore, one of our 2014 alumnus, Eva Lomazov, helped plan the entire event as the Co-Program Manager. Not only did we have three members of our team involved with the core planning and coordination, but we had a multitude of

see **OWNING CALGAMES**, Page 2



A top view of the 3D model of the hexagonal bumper frame.

Cannon, had a weakness: we were unable to escape when pinned after a “T-bone” collision by another robot. Up until the championships, we had free control of the field, but as teams gained more experience and competition grew fiercer, our opponents began to take advantage of this weakness. Over the summer, we focused on solutions to eliminate this flaw.

We noticed teams like 971 and 148 modifying the shape of their drivetrains from the conventional rectangular frames to hexagonal and octagonal frames. After performing force analysis to learn why this worked, we concluded that making the sides of the frame angled would benefit us in three ways. First, the frictional force between the

two robot bumpers in the direction of our driving force is decreased because it is no longer perpendicular to the driving direction. Second, the normal (contact) force between the two bumpers is also decreased because some of the force from the defending robot is now in the direction of our driving force. Lastly, the components of the force from the defending robot in the direction of our robot is added to the driving force of our robot, allowing us to easily escape.

After realizing these benefits, We looked at changing our frame from a rectangle with flat sides to a hexagon with angled sides, and we discovered we could move the sides out almost three inches on each side while only increasing the perimeter by one inch! Now a robot impacting on the side would slide off at a 12 degree slope. Nikita Seth, a member of the girls’ subsystem who worked on the drive frame during the season, extended the bumper standoffs in CAD and machined new bumper attachments to the robot frame. I worked on the angled bumper wood to attach to the angled frame, joining the two pieces

of wood using a box joint at an angle.

There was still one more critical component of the bumpers: the fabric. The friction between bumpers was the main source of being pinned, so I set out to research types of low-friction fabric. I learned that Team 254 had been using sailcloth during the season, which had one-third the coefficient of friction of normal fabric, and that would make our robot much more slippery.

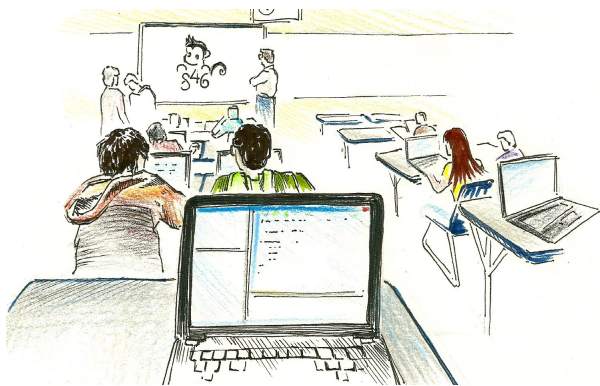


The wood on the hexagonal bumpers are joined with a box joint.

The new bumpers not only looked beautiful, but also

proved extremely effective in competition. As the driver of the robot at our two offseason competitions, Chezy Champs and CalGames, I noticed that the robot was never pinned. We were agile and could manipulate around the field easily under defense, resulting in a superior performance at both events.

This project not only allowed us to prove the concept of hexagonal frames for ourselves, but also gave us experience with angled frames and bumpers. If future games require escape from defense again, we now know the solution to the problem.



Among the five workshops offered, the most popular is the computer-aided design (CAD) class, where new members learn how to use a computer program called Autodesk Inventor to properly create 3D models and machinist drawings. In a separate machining workshop, future machinists are taught how to read these machinist drawings to make robot parts accordingly.

The electrical workshop is another popular class. Students learn about key components of our robot such as speed controllers, power distribution (PD) boards, and sensors while obtaining hands-on experience in tasks like crimping wires. Freshman Tejasvi Kothapalli remembers, “In

terms of electrical, I was at square zero. I had never seen PD boards, power switches, or cRIOs. But now, I know about each component and its importance to the robot.”

In addition to the previous three workshops, new students can go to software workshops that make coding an exciting, hands-on experience. Every workshop, students develop code and test it on the physical robots from previous years. Sophomore Frank Lin says, “One time, my code caused the robot to spasm violently. Even though that happened, I saw why my code was wrong, and I was able to fix it.”

The team also hosts smaller animation workshops for the more artistic members. The animation team uses the Autodesk Maya program to create a short video about safety for the annual FIRST Safety Animation Award contest. This year, the animation team led by Senior Alex Shmakov has created a Safety Superheroes animation, which depicts a student learning to work and dress safely in a workshop setting.

With the successes of the workshops, enthusiastic underclassmen like Tejasvi Kothapelli are eager to jump right into build season. Kothapelli says, “I want to contribute

to the robot during build season, but without the workshops teaching me how the robot works, I wouldn’t have the authority to change the robot in any way. I want to make the robot better. I want to be the guy who cuts out the pieces. I want to be the guy who writes the code.” The team expects to have a great build season because these workshops have both engaged new members in robotics and encouraged them to contribute to the robot during the build season.

volunteers from our team. These volunteers had engaging roles in the event like keeping score, resetting matches, and passing game pieces around during matches. Our team even provided a live YouTube webcast for people who could not attend the event.

CalGames, altogether, was a rousing success. We won the event, took home the CAD award for our robust use of CAD, and involved many members of the team in running the event itself. It truly was a great way to wrap up an amazing 2014 season. Co-President Raphael Chang (12) even said, “I’m proud of what our team has been able to accomplish with the Funk Canon robot and I look forward to improving our performance even more next season.”



ROBOTICS AS A CLASS?

WOULD YOU TAKE ROBOTICS IF IT WAS A YEAR-LONG CLASS?

STUDENTS CURRENTLY IN ROBOTICS

STUDENTS CURRENTLY NOT IN ROBOTICS



PRO: WORK CAN BE DONE DURING SCHOOL HOURS. IT'S CONVENIENT -- MORE WORK CAN BE DONE



PRO: A GRADE ENCOURAGED PEOPLE TO PARTICIPATE MORE, THUS INCREASING ACTIVE MEMBERSHIP

PRO: IT WOULD BE A VERY INTERDISCIPLINARY COURSE: COMBINING PHYSICS, ENGINEERING TECH, AND COMPUTER SCIENCE

CON: SPACE COULD BE LIMITED IF ONLY ROBOTICS CLASS STUDENTS MAY BE A PART OF THE TEAM

Pauline Lee (*junior*)

Lynbrook offers a wide array of classes, extracurricular activities, and clubs, ranging from photography club to boys and girls volleyball. Some of the clubs on campus, especially Robotics, thrive by attracting a wide variety of people through their engaging activities and new learning opportunities. The continual wide-spread interest in Robotics as a club, however, leads people to wonder whether or not students would be willing to take Robotics as a year-long class.

The Lynbrook Robotics program would be somewhat similar to that of Boulder High School, a public high school in Colorado. Boulder High School offers a semester-long Robotics class that does not require students to have any prior knowledge. Lynbrook's Robotics class would cover all the essential topics of Robotics, including Computer Aided Design, the construction of simple robotic devices, and modern-day applications of robotics. Students then would use this basic knowledge to design and build custom robotic devices and represent Lynbrook at regional and national FIRST competitions.

Although this gives us a general idea of what the class would entail, much remains obscure. Questions still remain, such as how the class would receive enough funds to purchase all the materials required to build a robot. Currently, the \$7,000 that are required to build a single robot are raised through generous member and parent donations. Whether enough students would enroll to account for the costs is uncertain as well. On the other hand, the Robotics class would allow students to receive credits for the course, explore engineering as a potential career, and would be no different from Lynbrook's college preparatory courses

like accounting or virtual enterprise classes.

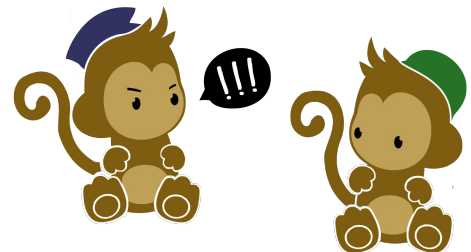
A survey taken by approximately 70 Lynbrook students shows that 13% of the students currently in Robotics would not take it as a class and a shocking 75% of students currently not in Robotics would. A common response as to why students would take Robotics as a class is that students would be able to gain a more thorough understanding of Robotics through professionally trained teachers. Some students also find having Robotics as a class appealing because they are able to work on the subject in set periods than in a club in which people can be prevented from participating due to other extracurriculars and time conflicts. Others are indifferent, if not skeptical, towards the idea of Robotics as a class because they simply aren't interested or they dislike the pressure incorporated in receiving a grade for the class. Abhiram Kothapalli, a current member of Robotics, points out that "members should be able to put in the time they want in the areas they want to learn" and that "making Robotics a class may impose certain restrictions which take away from the freedom of a club structure". However, students such as Davin Tjong like the idea of Robotics as a class "because club activities typically aren't perfectly conjoined with school hours" and finding means of transportation is a hassle.

Although Robotics will remain a club as of now, the chances of its becoming a class in the future remains promising. Student opinion towards a Robotics class is positive as a whole, and students will be able to explore a new field in a low-pressure environment. If determined to do so, administration and students can join to solve problems such as raising funds through various means like fundraising and parent donations.

Scout Monkeys and Field Advisors

Former drive coach Miles Chan discusses ways to improve scouting to benefit the team in future competitions.

Miles Chan (*alumnus*)



The one thing I would change to increase our team's student involvement and competitive effectiveness at events would be the creation of an effective scouting system; the way we collect quantitative and qualitative data for making match strategy and alliance selection decisions.

Our scouting system is currently ineffective. We start by creating sheets for recording points scored and other quantitative data. We surprise students in the stands, asking if they would fill these papers out all day long. We finish by failing to provide a reason why students should care about collecting accurate information. We do not analyze and deliver data collected on a regular basis to the drive team. Our failure to motivate and train students leaves us with incomplete, inaccurate, and unused data as well as general unhappiness.

How can we motivate our students to put effort into scouting? Team 1114 mentor

"better data and happier scouts at events lead to increased competitiveness and student involvement"

Karthik Kanagasabapathy suggests making it fun, saying "we actually have kids and mentors gamble on matches with fake currency . . . people want to pay attention to lots of matches so when the next bet comes up, they can be better informed." This adds the thrill of competition to filling out scout sheets, making the job interesting and satisfying.

How can we ensure that our scouts provide accurate data? Our scouting leader must identify who is scouting before events and spend a few meetings training our

see **STRATEGIC NEEDS**, Page 4

scouts to do their jobs with quality. At these meetings, students would practice scouting robots at other events through webcast. Veteran students would ensure that scout sheets are filled out properly and that the scouts see what qualitatively constitutes good driving and defense.

How can we make sure that scouting data makes it to the drive team in time to have an impact? My solution comes from my experiences doing qualification match strategy with 254 and 971 at SVR. I was surprised that our discussions did not heavily involve 254's and 971's drive coaches, Travis Covington and Austin Schuh respectively. They were instead dominated by EJ and Travis Schuh, people separate from the drive team who spend time observing matches.

I realize now that their positions as field observers, combined with access to scouting data, gives them awareness of how other teams are doing on the field that the coach, who lives in the pits, does not have. I believe we should also have a field observer, who operates as follows.

A student who watches matches, separate from the busy scouting leader, collects and synthesizes his/her observations and our scouting data into possible match strategies. By taking care of getting data in a usable form to the drive team, this student ensures that the drive team can easily make use of our scouts' hard work and gains the outside perspective we otherwise lack when doing strategy.

By implementing these changes to our scouting system, I believe that we will have better data and happier scouts at events, leading to increased competitiveness and student involvement.

Good luck in FRC 2015!

Building Our Team

Our team often attends events outside of school to raise money and to support our sponsors.

Davin Tjong (*freshman*)

On a bright Saturday morning, 25 students and parents met at the Marina Green Park near the mouth of the San Francisco Bay to raise money for our team. The occasion? Fleet week. To sufficiently fund our team every year, members on our team volunteer at



Owen Li (junior) seals the deal on a 150 dollar flight bomber jacket.

events such as the San Francisco Fleet Week. These events not only supply the team with money, but also provide good opportunities for members to get to know each other better.

At Fleet Week, a two-day air show held in San Francisco where people could watch the Blue Angels Flight Demonstration Squadron, members from our team sold souvenirs to visitors watching the show. The members got up early in the morning to volunteer on both Saturday and

Sunday and managed multiple souvenir stands. These were an enjoyable two days of team building, and in total the team sold \$24,000 worth of items and received a percentage of the revenue resulting in \$1,500 for the team. Rookie member Bill Zhu thought that "it was a great day because [he] helped raise money for the team while watching the amazing air show."

Fleet Week not only gave members an opportunity to meet new people, but also let students watch the awesome air show hosted by The U.S. Navy. Many members enjoyed watching people parachute down from the sky and listening to the loud noises of airplanes maneuvering in the sky on top of getting to know the other members of the team. Megan Lau (12) says that "the best part about Fleet Week was that it was really fun to sell souvenirs to visitors while hanging out with all the new members." Everyone who attended the air show had a fun day socializing and watching the different planes do cool tricks.

What does a non-invasive surgery have to do with our team's high-energy, ball-chucking machines? Both are robots! During an event hosted by our sponsor Intuitive Surgical, members of our team and other robotics teams toured the Intuitive Surgical company's facilities and saw various robots manufactured by the company. Members were even given a chance to make simple movements with the da Vinci XI surgical system, which uses intuitive controls to do detailed work on everyday objects and even the human body. This was a good opportunity for our club's members to see how robotics engineering is applicable outside of the competitions the team participates in.

Intuitive Surgical's Senior Director in Quality Engineering, Bob Sundstrom, then gave a short talk on general advice for building robots. He emphasized the importance of

prototyping and failing at an early stage of building rather than later, especially during a competition. This did not just broaden students' perspectives of robotics outside of school, but also gave great guidance on better preparing the team for the upcoming build season. After these two presentations, the group then headed to see the "U" system that effectively controls how assembly lines in factories are moved, showing students the importance of accuracy in making parts for a robot.

The students who went to this demo got firsthand experience on how modern technology is advancing the world. Every student who went enjoyed both learning about the newest technological advances and receiving expert advice on building robots. Joshua Yuan (12) said that "This was my first, and last, Intuitive Surgical open house and definitely something worth going to."

Class of 2014 | Alumni Map

