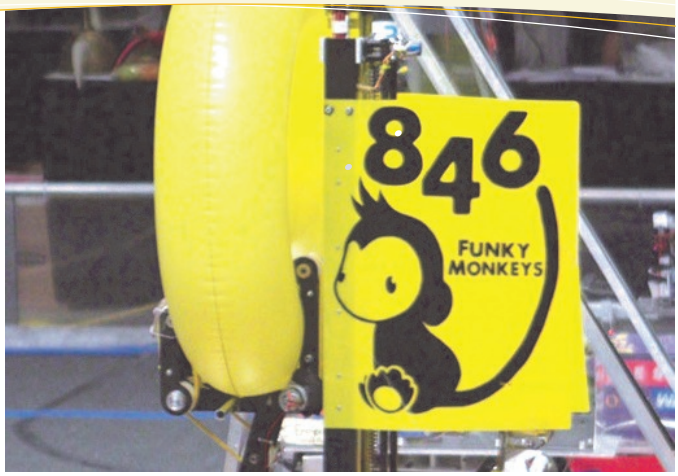
Spring 2011

Monkey Business

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

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Funky Monkeys Compete in Championships

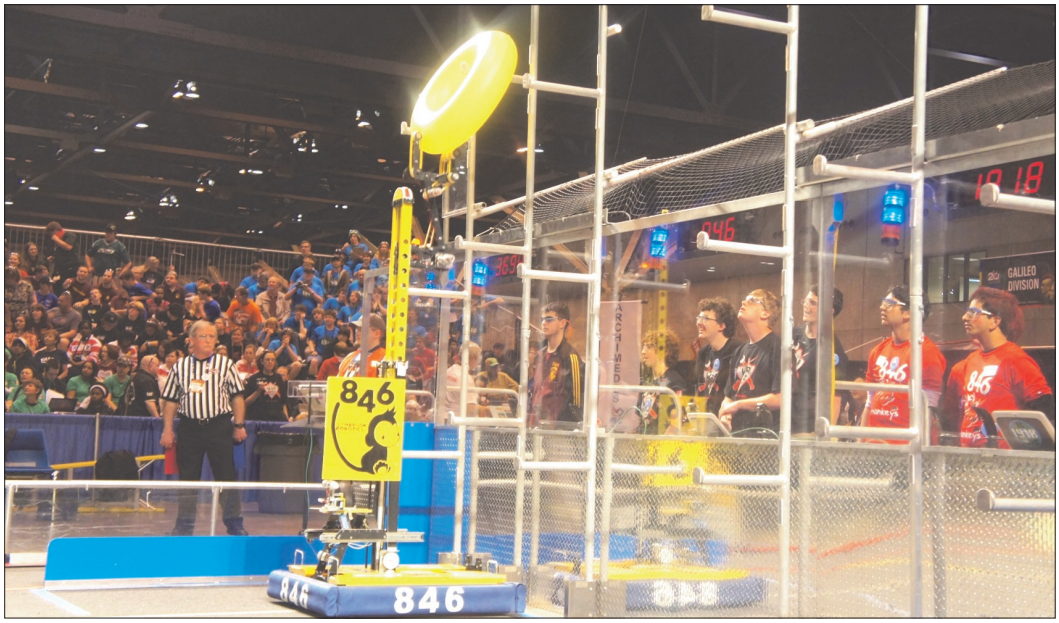
By Haochuan Ni and Jocelyn Shieh

The Lynbrook Robotics team reached new heights in the 2011 *FIRST* Championships as it competed with some of the best *FIRST* Robotics teams in the world. This was the first year that the Lynbrook Robotics team, the *Funky Monkeys*, had qualified for Championships.

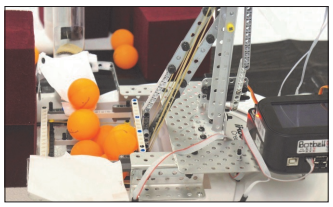
Earlier in the season, at the Chesapeake Regional in Baltimore, the *Funky Monkeys* were recognized for their efforts to inspire students to pursue engineering and received the Engineering Inspiration Award. The team's work hosting CalGames and the team's first place 3D Safety Animation were among several reasons cited. As the recipient of the second highest award, the *Funky Monkeys* earned an invitation to attend the 2011 Championships in St. Louis.

"When the judges announced that we'd won, I vaguely recalled that the award was a qualification for Championships," said team co-president and robot driver Chinmay Jaju. "As

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ABOVE: Lynbrook Robotics' robot, the Hand of the Monkey, plays a match of Logo Motion. Here, it scores an Ubertube during the autonomous period at the beginning of the match for bonus points.



Five Years of Botball

By Miles Chan

Coached by the students of the Lynbrook HS Robotics team, the Oak Grove High School Eaglebots competed in the Northern California Regional Botball robotics competition this April. Over the last five years, the Oak Grove team has steadily improved in performance, winning numerous regional honors.

When the Lynbrook students first began coaching Oak Grove teams in 2007, they were a disorganized and inexperienced group of students without clear goals. The Lynbrook student team worked hard, helping the Oak Grove teams design their robots, write their 'C' based code, and manage the Oak Grove team during competitions.

"Every year, we brainstormed ideas and built robots with them," said Lynbrook Robotics co-president Karena Cai. "I don't think they would have made it without our help."

This year, however, the Lynbrook found a more competent and self-sufficient group that built their own robots and could prepare themselves for competition. Oak Grove senior Andrew Michel-

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LEFT: Robot operator Karthik Viswanathan and driver Chinmay Jaju manipulate the Hand of the Monkey on the field while drive coach Alexander Lin provides them situational awareness during a qualification match. The team would eventually advance into the elimination matches.

Championships

Continued from page 1

soon as we verified it, I was ecstatic."

Some of the best teams in the world attended the event. *Simbotics*, team 1114 from Canada and *The Cheesy Poofs*, team 254 from San Jose, both of whom had won multiple regional competitions were among the 350 top notch competitors. "Facing off against such experienced teams was daunting," said team vice president and robot operator Karthik Viswanathan.

To streamline scoring methods, the team implemented a cleaner scoring routine in which the team drove the inflatable tubes onto pegs of the scoring grid and lowered the elevator to release the tube from the grabber. The team took every opportunity it could grab on the practice field to improve their game play.

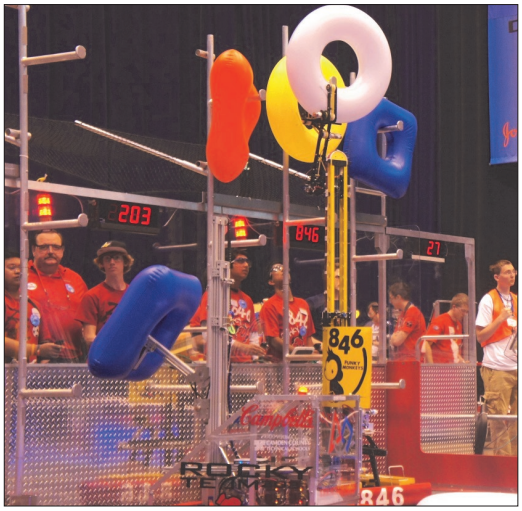
In the final alliance selections, the *Funky Monkeys* joined the 6th Alliance with *Holland C.H.A.O.S* team 74 of Holland, MI and *The Captains*, team 3098 of Waterford, MI. In two exciting matches, the team's alliance lost 111-108 and 104-102 to the 3rd Alliance and were eliminated in the Archimedes quarterfinals.

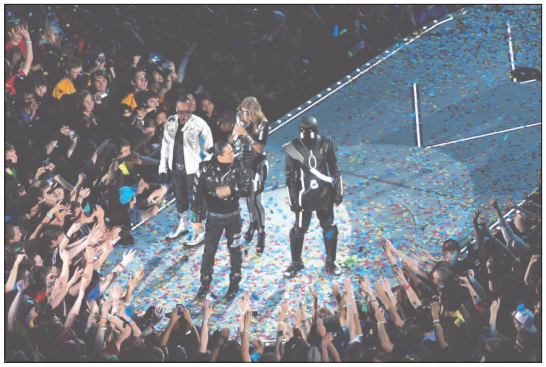
In the 2011 *FIRST* Robotics season with 2081 teams participating, only 96 teams had the chance to play in elimination rounds at the Championships. As a quarterfinalist, Lynbrook Robotics ranked in the top 5% of the *FIRST* Robotics program worldwide.

"Of course we were initially disappointed," said Karthik, "but overall we were extremely happy about how capable our robot was and how much we were able to accomplish." This year, the Lynbrook Robotics team finally has a home on campus. The new workspace will allow the team to meet on a daily basis and give it easy access to its robots. The *Funky Monkeys* hope to bring their competitive experience to a new level next year! ■



LEFT: The FIRST Championship opening ceremony in the Edward Jones Dome. Over 350 FIRST Robotics teams attended the event, including international teams from Brazil, Canada, and Israel.





LEFT: The Hand of the Monkey was completing its first logo pattern. TOP: The Black Eyed Peas performed an exclusive concert for all FIRST teams attending the Championships

Botball

Continued from page 1

sen had singlehandedly designed and programmed two Legobots for scoring points and scripted the larger iCreate, a robotic vacuum cleaner, to wreak havoc on the opponent's robots.

But while Michelsen and his team enjoyed success, the second Oak Grove team struggled to build their robot in the final week before the competition. Helping them out, the Lynbrook students hastily created two robots: one with a 4-bar linkage based arm attached to an iCreate that was designed to place ping pong balls in an overhead basket, and a second Legobot robot designed to move paper airplanes across the gameboard.

At the North Cal. Regional, both teams fielded by the Oak Grove Eaglebots exceeded expectations. The Oak Grove team with hastily built robots, led by Lynbrook students, placed fifth in the competition, while the team led by Michelsen made an exciting comeback win to finish third overall, and earned the Overall Judges' Choice Award.

"Mentoring the team to win in competitions was extremely satisfying," said vice president Karthik Viswanathan. "But the best part is watching the team slowly become self-sufficient."

Both Oak Grove and Lynbrook participants benefited from the mutualism: the Oak Grove team gradually improved their competitive edges under Lynbrook's tutelage, and Lynbrook Robotics members gained experience in leadership. "Botball gave me an unique opportunity to take on a prominent leadership role on a robotics team," said rookie Lynbrook Robotics member Michael Lin. ■

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Iterations of the Elevator

By Haochuan Ni

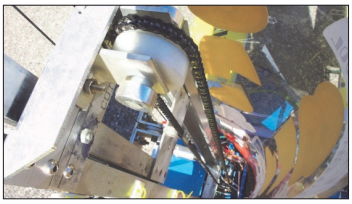
Four of the ten robots built by the Lynbrook Robotics Team have used elevators. During competition, we've seen the strengths and weaknesses of each of our elevators. Here, we analyze the evolution of our elevator design.

2007: Rack n' Roll

The elevator made its debut on Funky Monkey robots in 2007. Inspired by the design of Archbishop Mitty Team 1351, the team decided to design its own elevator. The robot incorporated a multi-stage elevator that constrained each stage to move at the same speed relative to each other. Compared to an arm with similar vertical reach, the elevator gives drivers much greater control as it has less lateral reach to exaggerate turning movements.



The routing of the pneumatic lines to the last stage has constant length even as the elevator extends.



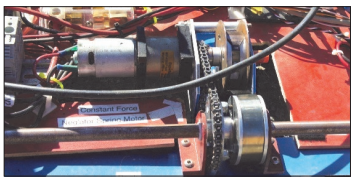
ABOVE: Multiple chain and cable runs allow each stage to move at the same speed relative to each other.

2008: *FIRST* Overdrive

The Funky Monkeys improved its elevator to raise the large red track ball for the 2008 FRC challenge. A constant force spring motor allowed the elevator to counteract the force of gravity and neutrally balance its load. Consequently, the load on the DC electric motor was significantly decreased. Due to the width of the elevator, the stages had to be driven up by two symmetrical sets of chains and cable runs to prevent the elevator from cocking.



BELOW: The constant force spring motor was coupled onto the electric motor shaft, making maintenance adjustments of the elevator stages difficult. Note the long shaft driving sprockets on both sides of the elevator. Long chain runs and non-planar pulley arrangements caused the chain and cable tensions to change as the elevator extended.



2010: Breakaway

Implemented again in 2010, the elevator was used to deliver hooks onto a horizontal bar for the robot's winch to lift the robot. With four telescoping stages, the cable runs rubbed against each other and against other stages' crossbar supports, creating very high friction. The lightweight construction of the elevator and the lack of heavy payload allowed friction to keep the elevator from unpowered sliding without a counterbalance.



BELOW: The friction from the four-stage design created high chain tension during extension, causing the sprocket mounts to warp from the forces. Aluminum angle beams were added for support to maintain the sprocket-to-sprocket distance.

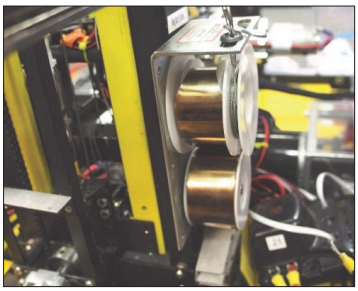


2011: Logo Motion

The latest generation of Funky Monkey elevators took the best features of its predecessors and improved even further. The three-stage design had the plane of its sprockets mounted parallel to the wide surface of the elevator, tucking the chains closer to the mounting point and decreasing the bending moment on the sprocket mounts. The neutrally balanced elevator can extend to 9.5 feet in under a second, making it one of the fastest elevators of its season.



This elevator had the electrical wires to the grabber on the final stage routed internally to minimize snagging hazards. BELOW: The constant force spring motor had its own, independent cable routing to ease maintenance and adjustments.



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Upcoming Events

Senior Graduation
— Thurs, Jun. 9
Lynbrook High School,

Team Picnic
— Sun. June. 12
Rainbow Park

GCER Botball Championships
— Sat. Jul. 9-13
Anaheim, CA

To Universities and Beyond

Zack Birnbaum
Carnegie Mellon University
Mechanical Engineering

Karena Cai
Princeton University
Mechanical and Aerospace Engineering

Jessica Huang
UC Berkeley
Statistics

Chinmay Jaju
Yale University
Mechanical Engineering

Alexander Lin
UC San Diego
Bioengineering

Aditya Majumdar
Columbia University
Chemical Engineering

Haochuan Ni
US Marine Corps
UCLA
Physics

Karthik Viswanathan
Stanford University
Electrical Engineering and Computer Science

Iris Wang
UC Berkeley
Molecular Biology

Linda Xu
MIT
Particle Physics

Reflections by Graduating Members

Seniors share their departing thoughts

Karena Cai—Co-President

My three years in robotics has truly been an incredible journey. I joined this club with the mindset that it was just another club, and was strictly defined by the building of a robot. After I enthusiastically jumped into the activities, the club evolved to encompass so much more. Robotics became a haven where I learned new things—both technical and non-technical, kindled friendships I never would have imagined, and did things I never thought I would be able to do without getting my fingers chopped off in the process! There would not have been any better way to spend my last three years in high school, both growing personally and developing the technical skills, as I always say in grants, "that will follow me into my professional career."

Jessica Huang—Veteran Member

You're not smart enough" was what my mother told me when I decided to join robotics this year. But that didn't stop me from joining such an amazing, well-organized club. Never had I seen such intricate machinery and



gadgets; being exposed to these greatly sparked my curiosity for engineering. Although I could not help much with the more technical aspects of the robot, it was still eye-opening to witness the grueling process of building this year's robot. Seeing the dedication and passion each member had for the club truly inspired me and made me love being a part of the LRT family, even if only for one year.



At the World Championship competition in St. Louis, there were even more teams and more people deeply involved with FIRST and its mission to spread interest in the STEM fields to our youth. These experiences, to name a few, have helped me pave a path toward the STEM fields for my future career. No matter what I end up doing, I know that somehow, the STEM fields will forever be intertwined with my life.

Chinmay Jaju—Co-President

Well, I can't say that robotics changed my goals in life and sparked my interest in STEM. I've always loved to see things mesh together, whether it be small plastic Lego gears, or the piston and cylinder of a minuscule combustion engine on my model airplanes. Yes, robotics has given me an outlet to peruse my interests in high school, but I find even more valuable everything I gained from just being able to spend with my team. I had role models to help me when I



joined, and I grew older, I realized that I was now the role model for the new incoming classes. Robotics has really been a family for me; I've met by best friends in this club, and I'll never forget the experiences we shared at the regionals and championships. Likewise, the knowledge about the technical mechanisms employed on our robot is something I will always carry with me. The non-technical grant writing and presentational skills have already proved invaluable, and I know they will be useful later in my life. I have robotics to thank for many of my accomplishments to date. I'm a funky monkey forever!

Karthik Viswanathan—VP

After being introduced to informatics in middle school, robotics became a clear medium to exercise my passion for programming. Writing "Computer Science" under my intended college major was a no-brainer by my sophomore year. Little did I realize, however, that there was much more than coding in store; electronics were a key ingredient of any successful robot. In robotics, the need to interface with electronic components through software became clear, my vocabulary started to expand into the world of H-bridges, communication protocols, PWM and more.

Indeed, merely writing computer science as my college major no longer seemed fitting. Since my chosen field of study would be determined from a combination of life experiences, why, then, should it be limited to just a single element? Before I knew it, the words on my application said it all: "Electrical Engineering and Computer Science."

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