

# STUY Robotics



Never Enough 7/16" Wrenches

**Building the Bot:  
Part X  
Robot  
Dissection**



Stuyvesant Robotics

In it to Win it

[www.stuypulse.com](http://www.stuypulse.com)



# Building the Robot

## Week 1

During the first week of kick-off, the team brainstormed designs that varied from bumpers and shooters to conveyor belts with hooks.

## Week 2

Throughout the second week the programmers worked on the RIO control system using a spare robot. At the same time the engineers modeled a design for the robot in Autodesk Inventor.

## Week 3

In the third week, the team built the drive train which controlled the gears and moved the robot. Multiple prototypes for the kicker were also created to see which would run the most efficient.

## Week 4

The fourth week of Build Season proved to be hectic for the StuyPulse team. The kicker, a key part of the design, was so weak that the ball barely moved when it was kicked. The team tried using springs, surgical tubing, and heavy-duty rubber bands to increase the kicker's power, but nothing worked. Finally a mentor and alumnus, Joe Blay, added a cam to the design, giving the kicker more force.

## Week 5

During the fifth week the team decided to design and create a hanger to hang the robot on the tower. Although this idea was not originally part of the plan, it proved to be a reliable way for acquiring bonus points

## Final Week!

The last week was dedicated to numerous trials and adjustments made to the kicker and drive train. The team also modified the autonomous and targeting codes for precision. After six hectic weeks the StuyPulse team was finally able to see the fruits of their labor!



# Dissecting the Robot

By Jake Potter

## HANGER

The hanger's star part is a blunted shark hook that holds the 150 pounds of robot seven feet off the ground.

## WINCH

Hidden in Donovan's body is the powerful winch. A CIM motor with a Dewalt gearbox from Tom provides the pull that can hoist Donovan up seven feet in just a few seconds.

## CAMERA

The eye of Donovan is a typical webcam - however, coupled with the cRIO and excellent programming it identifies the targets on the goal and rotates the robot to bulls-eye accuracy.

## BALL MAGNET

A polycord band transfers motion from the motor to the roller. When a ball is trapped, the roller stalls while the motor continues spinning, allowing us to hold the ball still.

## DRIVETRAIN

Donovan uses a 6-wheel drivetrain powered by 2 CIM motors on either side. The front wheels are aluminum-rimmed instead of the kit plastic to survive the impacts from going over the bump.

## KICKER

Twin cams cock the kicker back at all times. When the foot is released, it snaps forward, powered by two 30-pound extension springs





# Competitions

In it to win it!

By Doron Shapiro

2010, our 10<sup>th</sup> anniversary year, also turned out to be one of our most successful. It all started at our first competition of the year, the New York Regional. During award presentations, we were surprised after hearing a poem full of sailing references, to be selected for the Rockwell Automation Innovation in Control Award. However, this award, which “celebrates an innovative control system or application of control components to provide unique machine functions” immediately made sense. This was a breakthrough year for our programmers in terms of both organization and mentoring, and the recognition showed that their hard work had really paid off. However, not content with just that, we went on to become semi-finalists, finalists, and then Champions (along with our friends at Miss Daisy, the Iron Maidens, and Mary Louis Academy) at the New York Regional! Talk about an exciting weekend! For the first time in two years, StuyPulse was going to Championships.

However, our regional season wasn't done yet. Two weeks later, we loaded up on a bus and drove up to the Hartford Regional. As our engineers prepared Donovan for New England's top robots, our small crew went over the Chairman's presentation the team had been preparing.

Hours later, in presenting the last award of the event, the Chairman's Award, the Hartford judges described a team that consistently spread the word about science, and technology, mentored teams from in their region, and found innovative ways to do Dean's Homework.



Stuypulse, team 694, at the Atlanta Championship.

## When they announced the team's name, our section of the stands went

For the first time in our history as a team, StuyPulse was doubly qualified to go to Championships.



## Seth Makes FIRST's First Dean's List

Just nine days before the due date, Dean Kamen revealed his newest award, the Dean's List, which is given only to the most dedicating and inspiring engineers. Each team may nominate two members, and we nominated Seth Berg, our president of engineering. Most of us were not surprised that he won this award because of his dedication. Seth has given up his place on the varsity football team to attend and stay the longest during all the meetings. Many of his designs were used in our previous robots due to their brilliance and simplicity. We are very proud to have Seth win the first Dean's List award and we wish the best for him at MIT!



The drive team getting ready for finals.



# FTC Competitions

The real hot shots!

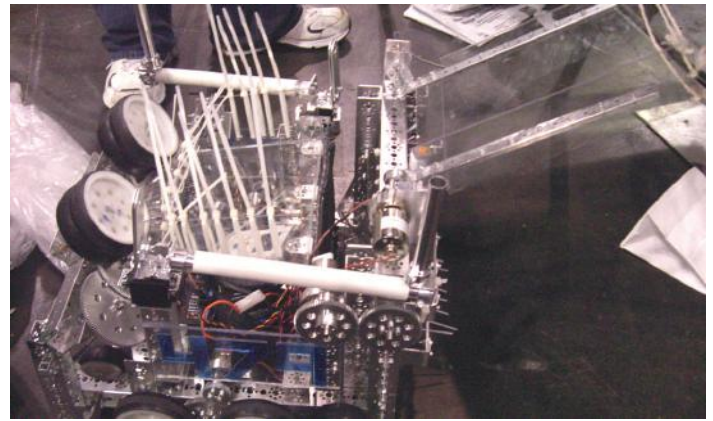
By Robert Juchnicki

Stuyvesant Fusion and Fission reached new levels of success in this year's FIRST Tech Challenge game, Hot Shot. The game was played on a twelve foot square field. Each corner of the field housed an elevated tube filled with fifteen wiffle balls. A lever released the wiffle balls, making them roll down a ramp and scatter across the field. Two alliances, each composed of two teams, sought to transport balls to one of three locations: a square mat in the center of the field, an elevated rotating birdhouse-structure in the center of the field, or a rectangular container three feet away from the field. Balls on the mat scored one point each, balls in a bird house scored five points each, and balls in the outer containers scored ten points each. Balls could only be scored into the outer containers in the last thirty seconds of a match, called the End Game. A yellow bonus wiffle ball could be deployed at this time and doubled the points of all balls in a location on the field if it was scored.

On kickoff day, the team immediately began strategizing. After the meeting, both teams decided that the optimal strategy would be gathering as many wiffle balls as possible before the End Game and then unload them all at once, while occasionally spinning the birdhouses to throw off teams seeking to score in them. After looking back to previous FRC challenges, they chose to use a flywheel to propel balls into the goal over a catapult mechanism, which would be difficult to implement within the required dimensions. For the next two months, both teams slaved over countless gear configurations until one successful dual flywheel mechanism was constructed and replicated. At this point the teams split to develop two unique acquiring mechanisms.



The 479 team at the New York City FTC Regionals at the Javits Convention



479's robot, Yimeng Bot, winner of the Rockwell Collins Innovate Award

Fusion opted for a design that used wheels to propel wiffle balls upward through two chambers in the robot onto a platform for storage. On the other hand, Fission pursued a design with a conveyor belt running two belts made of rubber bands that carried balls into a hopper. Both teams soon struggled with their intended designs: rubber bands produced too much tension on rollers for Fission's conveyor and powered wheels did not project balls far enough within Fusion's robot. At the end of December, both teams decided on complete redesigns. Fusion would now build a spinning acquirer with bristles to whisk in balls onto an elevator system that would rise up once at the end of the match to get balls into the flywheels. Fission decided on a conveyor with one friction pad belt that would sandwich balls between itself and a wall to convey them into a hopper to be gravity fed into the flywheels. Both teams' building processes now coincided with FRC build season for the final stretch. Fusion and Fission were both crunched for time going into March, but the teams completed their robots in time for the competition.

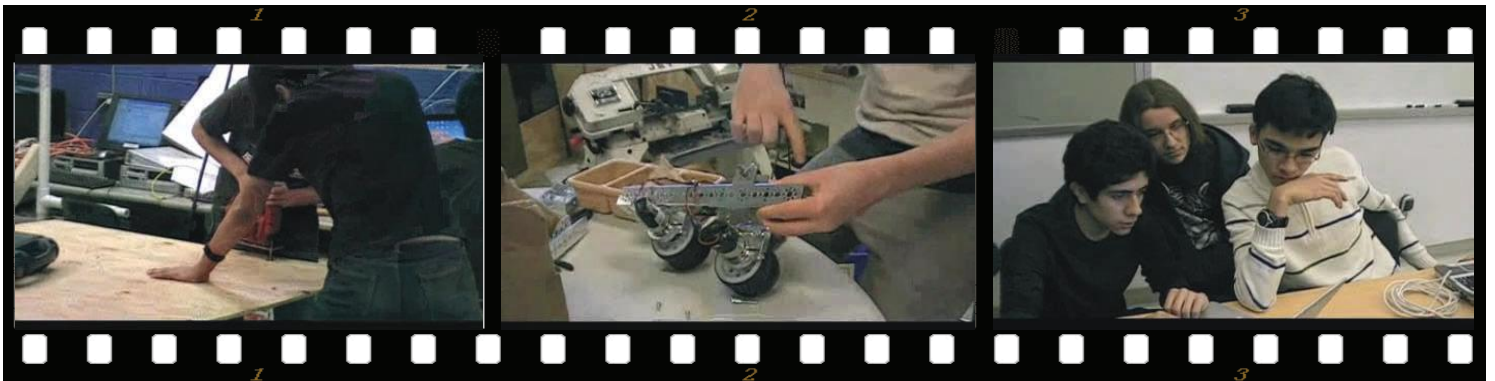
At the New York City FTC regional, both teams encountered great difficulties from the start, mostly on the programming side. After battling with some issues with its elevator mechanism, Fusion overcame hardship to get through to the finals for its division. Fusion fought to the end, but came short by a few points and did not move on to the event finals. Despite Fission's robot being unable to move for its first two matches due to Bluetooth and field control issues, the team's well-executed design, well documented building process, and extensive outreach impressed the judges. As a result, Fission was given the Rockwell Collins Innovate Award. The winning team displays elegant design, robustness, and 'out of the box' thinking as documented in its Engineer's notebook and presented to the judges. Both teams overcame major setbacks to win Stuyvesant's first FTC awards. Both teams are ready for stronger programming in the coming year. Stuyvesant Fission and Fusion are eager to make the coming year's competition an even greater success, with many more awards to be won.

# Media and Outreach

## "The Lab" and Other Videos By Mao Hu

When we began putting together videos last year, we had numerous goals in mind. Firstly, we wanted to help out rookie teams or teams that do not know where to start. Spencer Birnbaum, the Director of Fundraising, decided to give pointers to teams about one of the most important factors to achieve a strong team, fundraising. One of his videos, "Fundraising Basics", having over a hundred views, outlines what teams should be preparing and what sponsors are looking for. In "Giving Back to the Sponsors", Spencer teaches how teams should repay the sponsors for their generous offers, ensuring their active participation in the next season. Secondly, we want to increase the interest or popularity of joining a robotics team. "The

Lab" series shows how fun robotics can be without losing the essence of being a part of FIRST. The story of a team working to achieve its dream of winning a tournament can be easily related to by many. "The Lab" also shows diversity, a plethora of ethnic groups working together, and a strong female presence. The Lab four part series already totaled over a thousand views. We will continue making videos, using the making of our previous ones as a learning experience.



It has now been almost two years since FIRST Connects.Us was first brainstormed in a marketing meeting, and its growth since then has been amazing. From this time last year, we've developed a powerful new redesign for the site with new features. In addition to searching our database and contacting other members and teams, current members can now share their robotics knowledge through tutorials and as well as offer and request parts and services to local teams. Each of these features is designed to help teams with different resources share with each other, making gracious professionalism even easier.

We have had impressive signups at all of our regional events, and even hosted a FIRSTConnects.Us scavenger hunt at the Championship event in Atlanta, GA. Teams from around the world tried to find mem-

bers of our team (a task much easier on the internet), and had a chance at winning free FCU t-shirts. All of this has had a visible impact: between our redesign, aggressive marketing, and referrals, the site's membership has more than doubled with new members and teams from around the country and around the world.

Most exciting, however, has been the official recognition we received this year. FIRSTConnects.Us was acknowledged in our Hartford Chairman's award as an innovative application of Dean's Homework and is now the official database of the NYFSA (New York FIRST Student Assembly). In the New York region especially, we've had useful feedback on where to go next, and together we have some ideas for improving our regional as a whole.

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# Mentoring and Service

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## Stuyvesant Robotics Reaches Out

By Mao Hu

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### Green Teams

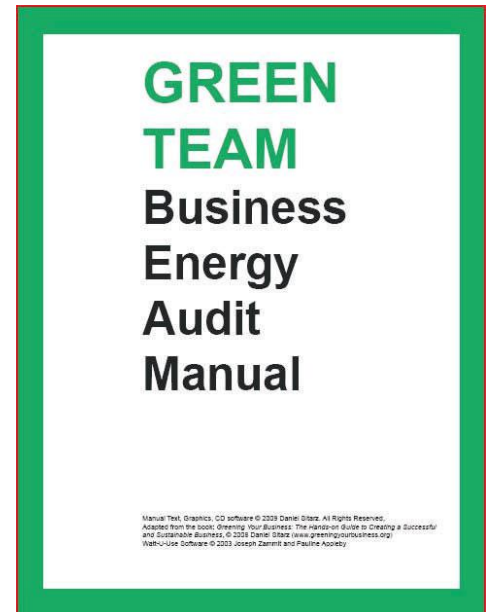
Our efforts as robotics innovators were recently recognized by FIRST, which selected us as a pilot team for the Green FIRST Energy Audit Program. As a Green Team, our members created customized information brochures and performed practice audits on their own homes before going out into the community. On our own, we have already performed an audit at a local pizzeria, and we have planned several more.

### FIRST Mentoring

StuyPulse makes a concerted effort to aid and inspire other students through hands-on mentoring. Our team works closely with local FIRST teams, inviting Team 3017, rookie 3419, and the Washington Irving FTC team to our lab to show them how our team operates. We recently machined parts for Team 2601. Our team members lead the discussions of the NYC Team Leadership Assembly, a live forum for FRC teams. Prior to build season, StuyPulse held a series of weekly lectures on team leadership and organization; over sixty people from twenty different teams attended. In addition to mentoring three FRC teams during the build season, StuyPulse also regularly mentors one Jr.FLL and four FLL teams, helping each of them from the first conception of their robot all the way to competition at biweekly, two hour long meetings.

### Collab Bots

Last spring, we ran an eight-week engineering and electronics workshop with a Brooklyn all-girls middle school together with the SoHo design firm Collab Inc. Introducing them to basic ideas like electrical circuits and programming through fun and interactive projects, such as building battery-operating lamps and magnetic “light graffiti”, we inspired their interest in science and technology.





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## Dedications

By Jack Chen

Since Yvette Ortiz joined the team with her son in 2008, she has been working non-stop to coordinate the logistics of every event, ensuring every team member has a room and that good lunch and dinner will always be provided.

In the short time that Jeanne Boyarsky has been with us, she has proved herself an invaluable mentor, taking precious time out of her busy schedule to see that the software development process goes smoothly, and always providing insightful aid.

Tom Ferguson is one of our most dedicated mentors. He provides ideas and assistance while offering Cox facilities when the need arises. His experience with designs and the feasibility of projects allows us to save time and resources while learning and making our robot more robust or efficient.



Mr. Rafael Colón's leadership defines how our team is run whether he's motivating us, helping us organize our time, or guiding the members of our team. Rafael has left an indelible mark on every team member.

Rafael knows how to guide members without giving answers. He always says, "My goal is to let them .... learn from their mistakes." Most significantly, Rafael emphasizes teamwork above victory. When tempers flare, he reminds us that we will remember the people we worked with, not the matches we won. However, this mentality doesn't stop him from being our team's loudest cheerleader.

Rafael shows us how to use everything from power tools to mills and the safety procedures associated with each. As alumnus Joe Blay puts it, "if he hadn't showed me that safety guard on the band saw, I'd be missing a finger now."

Rafael generously gives his time working in our school's lab until ten at night, on weekends, and throughout school vacations because he wants to be with us. As team parent Nancy Yabroudi said, "I've seen a lot of coaches where they want to win .... I have to say all day, and all night, every time, Rafael is in it for the kids."

## Executive Council

President of Engineering: Seth Berg  
President of Marketing: Betsy Soukup  
Vice President of Engineering:  
Jonathan Lambert  
Vice President of Marketing: Mao Hu  
Director of Programming: Emily Mat-  
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Assistant Director of Programming:  
Alejandro Carillo  
Director of Engineering: David  
Sugarman  
Director of Procurement: David  
Sugarman  
Director of Electronics: Adam Yabroudi  
Director of Field Construction:  
Samantha Unger  
Director of Strategy: Samantha Unger  
Director of Safety: Jake Potter  
Primary Machinist: Adam Yabroudi

Director of Fundraising and  
Director of Outreach: Spencer Birnbaum  
Director of Graphics: Sunny Wu  
Director of Animation: Elliot Cohen  
Secretary: Jessina Wong  
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## Mentors

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Tom Ferguson, Ian Ferguson ('05), Mel  
Hauptman, Colin Holgate,  
Ron & Catherine Kunicki, Dan Lavin,  
Abigail Laufer, Adam Leeb, Robert Lin,  
Joe Ricci ('03), Andy Woo ('96)

## Parents

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Broder, Mark Cohen, Malcolm Handte,  
Marlan & Miriam Ketani,  
Rita & Steven Meed, Janet Perr,  
James Potter, Fay Rosenfeld, Suzanne  
Shapiro, Pam & David Soukup, Beth  
Sugarman, Adele Ursone, Nancy and  
Jamil Yabroudi, Yvette Ortiz

## Faculty

Principal - Stanley Teitel  
Robotics Advisor - Rafael Colón  
Coordinator of Technology Education -  
James Lonardo  
AP of Technology - Dr. Raymond  
Wheeler