

LEGO In Schools

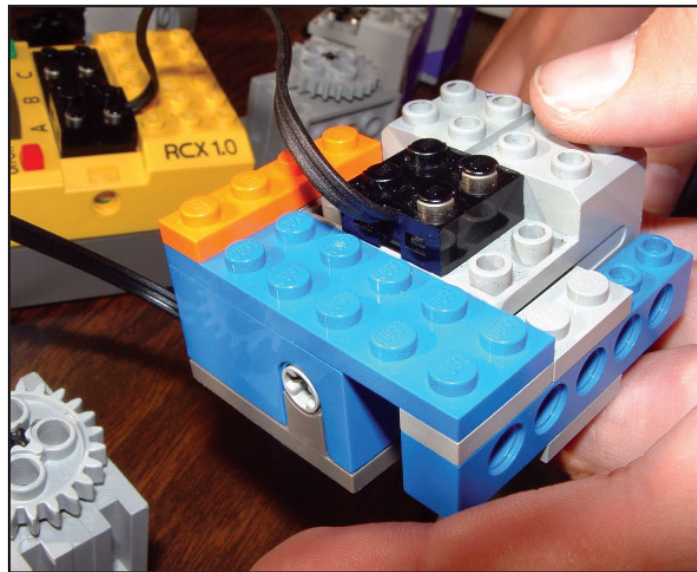
by Greg Intermaggio

While there are certainly many products that offer kids an opportunity to learn the principles of robotics, we can all agree that LEGO deserves a crown and a medal for all its given to roboticists of all ages throughout the years. LEGO MINDSTORMS NXT is an educational kit comprised of a stable robotics platform, making it easy to prototype, build, program, and modify robots with powerful hardware tools like ultrasonic sensors, and software tools like the NXT programming environment. The software kit — a set of 46 programming tutorials — is completely visual. There is not a single written instruction, but rather a series of images and videos that serve to explain the program in impeccable detail.

If you're a school with Mindstorms kits and you want to compete and learn even more than you can in the classroom, there are many great competitions you can go to. This article will cover three of these events, two of which are annual events — RoboGames and First LEGO League, while the third — LERN — is a new event which will consist of several events throughout the school year.

ROBOGAMES

Every year, thousands of people flock to San Francisco, CA. They come with a purpose. They are the efficient ones. They are the critical thinkers. They are the ones who you call when you need something fixed. But for this weekend, they are the competitors in the annual RoboGames, which takes place every June at Fort Mason.



What makes RoboGames special is not only that it is the world's largest open robotics competition, but that it has a special allure to it. At RoboGames, robotics no longer becomes the obsession of the antisocial geek, but the obsession of everyone who gets within 100 yards or so of the building. The excitement starts with the slamming and crashing of 340 pound robots smashing each other to smithereens, and the cheers of a thrilled crowd as their favorite robot wins a gold medal after the fight.

Once they've been drawn into the astounding fracas of the ComBots events at RoboGames, the casual onlooker is intrigued and often inclined to pick up the hobby, themselves, but where to start?

Interestingly, a significant number of competitors at RoboGames are under the age of 18. What used to be a hobby for only the most tech-literate geek has become an opportunity for a father-son weekend activity, or a crack at something educational. What sparked this change was not only a changing attitude in the 21st century towards a tech-centric future, but also the new availability of products that allow kids to learn fundamentals of engineering, programming, and robotics in general while not overloading them with too much information or mechanical parts that are simply too hard to work with without prior experience.

This year, RoboGames will be hosting a total of five LEGO events, all of which are available in the junior (<18) class. These events are LEGO LineFollow, LEGO Bowling, LEGO TubePush, LEGO Sumo, and LEGO Open.

LEGO LineFollow

Oddly, what seems like such a straightforward and perhaps even boring LEGO event is often one of the most intense, fun, and even emotional ones. LEGO LineFollow is exactly what the name implies: Contestants build and program an autonomous LEGO robot to follow a black line

on a white surface. Most commonly, the line is followed by using light sensors to detect the line's position relative to the robot, however it's not uncommon to see teams find alternative solutions. This is a great competition to get your feet in the water and to see what the LEGO events are all about.

LEGO Bowling

Scored similarly to normal bowling, the object of LEGO Bowling is to create a robot that autonomously sends a ball rolling down the four foot alley to knock down as many of the pins as possible. While this may seem like an easy task, consider that the ball is only two inches in diameter and the pins are even smaller. This event is primarily an engineering challenge to create a mechanism that will launch a ball accurately down the lane to knock the pins down. LEGO Bowling is a great opportunity to hone in on your mechanical skills if you're ready for a step up from the standard LEGO car design.

LEGO TubePush

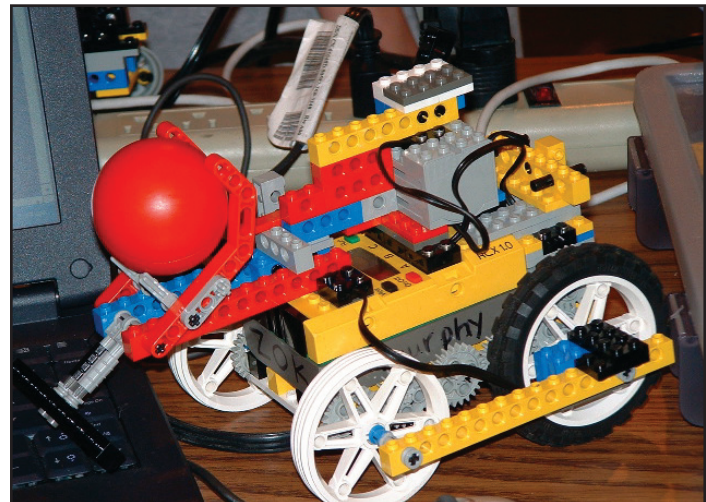
LEGO TubePush is an excellent event for builders of all levels to test their abilities and learn from each other. The goal of the competition is to pick up, move, and/or knock down as many tubes as possible. While the scoring system may be a bit confusing, it's designed to give everyone a chance to win — from the most advanced robot that can detect and pick up every single tube, to a simple rover that runs through the "S" shaped course to the finishing area while knocking down tubes along the way. LEGO TubePush is an excellent event for just about any robotics hobbyist, as it offers challenges for every experience level.

LEGO Sumo

While technically in its own category of events (Sumo), LEGO Sumo is one of three LEGO events that is open to contestants both under and over 18. The event is an extremely exciting one — two teams go head to head and try to push the opposing robot out of the black Sumo ring. The goal is to either push your opponent's robot out of the ring or to incapacitate him while avoiding a similar fate. There will always be debate over whether or not it's appropriate to face children against adults in an event of this caliber, but RoboGames manager, David Calkins, says "The beauty of LEGO is that it offers an even playing field. With other robotics competitions, adults have the distinct advantage of being able to purchase more expensive tools and parts; whereas with LEGO, everyone is using pieces from the same sets. So it becomes a question of creativity, rather than funding."

LEGO Open

This event is a simple, Best-In-Show competition. With divisions for both juniors and those above the age of 18, entrants range from Rubik's Cube solving robots designed by college graduates, to aquarium maintenance robots designed by middle schoolers. To those builders who are drawn to LEGO because of the creativity it entails, this



event is definitely the one for you.

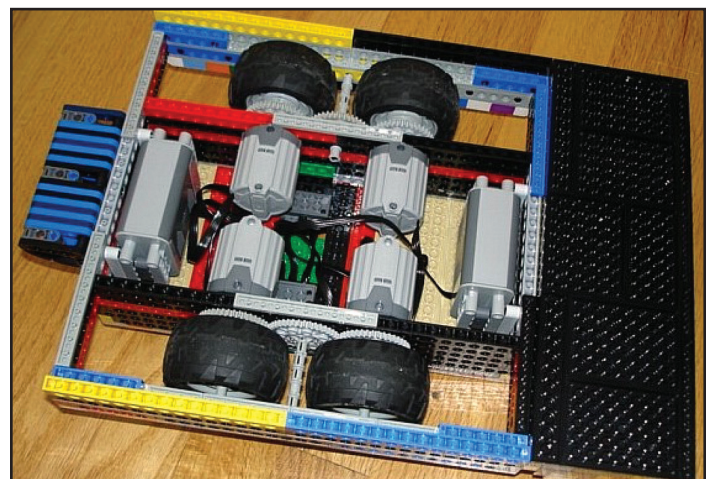
LERN (LEGO Education Robotics Network)

There's a unique mental condition that often befalls competitors after RoboGames competitions. RWS — or Robot Withdrawal Syndrome — is characterized by mild depression, boredom, and general lack of motivation. This year, the good people at LEGO Education are starting a pilot program in the California Bay Area to save our students from RWS. The program, LERN (a clever acronym for LEGO Education Robotics Network), is a bold attempt to turn robotics into a new type of track and field meet; K-12 school teams from across California will travel to neighboring schools to compete in robotics events ranging from creating a drag-racing robot, to building and programming a bi-pedal (two-legged walking) robot.

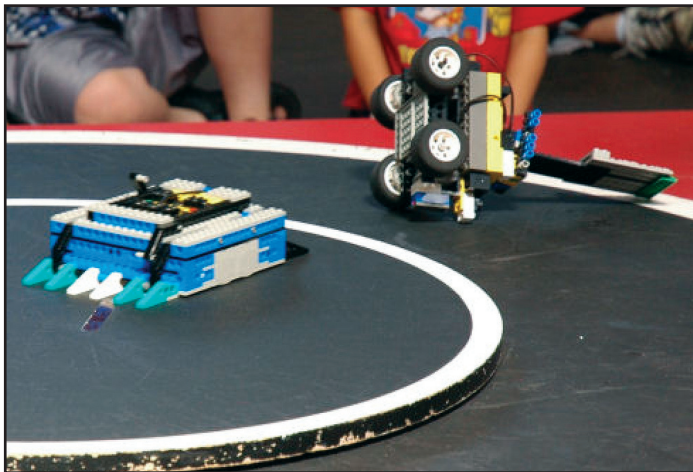
Starting this spring, LERN will include many of the LEGO events from RoboGames listed previously, as well as the following:

LEGO Bull in a China Shop

An excellent event for rookie teams, Bull in a China Shop is a fairly simple event. The competing robot starts in a ring and is programmed to knock a variety of objects out



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of the ring, ranging in size from LEGO Bricks to soda cans as quickly as possible. While the length of a round is two minutes, the goal of the competition is to knock all objects outside of the ring in the shortest amount of time.

LEGO Drag Racing

The object of this event is simple: create a robot that will race down the course at a high speed and outpace your competitors. While there are certain programming requirements (robots must wait five seconds after the "RUN" button is pressed before moving down the course), this competition is primarily an engineering challenge. It offers an excellent opportunity to learn about gear ratios and weight efficiency. The fastest (and often the lightest) robot will win the race.

LEGO Shot Put

LEGO Shot Put is an event that will challenge competitors in both engineering and programming ability. The competing robot must navigate itself along a four foot black line towards the shot put ring, and entirely into the ring. At that point, the robot must pause for several seconds to allow judges to inspect the robot's positioning and ensure that no part of the robot extends beyond the edge of the ring. Finally, the robot turns 90 degrees to face



the landing zone and launches a ping pong ball as far as possible. One point is awarded for every centimeter the ball flies before hitting the ground for the first time. Additionally, two points are taken away if the robot does not pause for an adequate amount of time (approx. five seconds) for the judges to inspect its positioning prior to launching the ball. The LEGO Shot Put event is an excellent event for all skill levels as it's often the most creative design that wins, not the most complex.

LEGO Magellan

Teams must design a robot to navigate a five foot by five foot grid from one corner to the other. Along the way, the robot must enter and exit a green box in the center of the course from the one "open" side (three of the four sides of the green box have black tape along them; the one that doesn't is considered the "open" side). The goal is to complete the course in the shortest amount of time. An additional time bonus is awarded to competitors who trigger the release mechanism inside the green box, releasing a balloon.

LEGO Woots & Snarks

Not a competition for the faint of heart, LEGO Woots & Snarks is one of the most challenging competitions currently planned for LERN. At the beginning of each match, a team is assigned either "Woots" (black cans) or "Snarks" (white cans). The object is to program your robot to push your assigned cans out of the ring and to keep your opponents cans in the ring. The winning robots are often the ones who are able to capture opponents cans and carry them along with them, while pushing out their own color.

LEGO Freeform

This is another one of those competitions that offers a perfect opportunity for beginners to compete with seasoned veterans. The object of LEGO Freeform is simple: Create a robot or robots to complete a series of actions based on a theme announced prior to the competition. Examples of actions are spinning around, throwing an object, moving an object, etc. The goal of this event is to foster the creativity and imagination that LEGO is known for and LEGO Freeform is a perfect place for it.

FLL (First LEGO League)

If between LERN and RoboGames, you still aren't getting enough LEGO robotics action, FIRST LEGO League is another incredible opportunity to hone in on your skills, and it happens every fall. FIRST LEGO League (or FLL) is a yearly international competition for ages 9-14. Every September, a

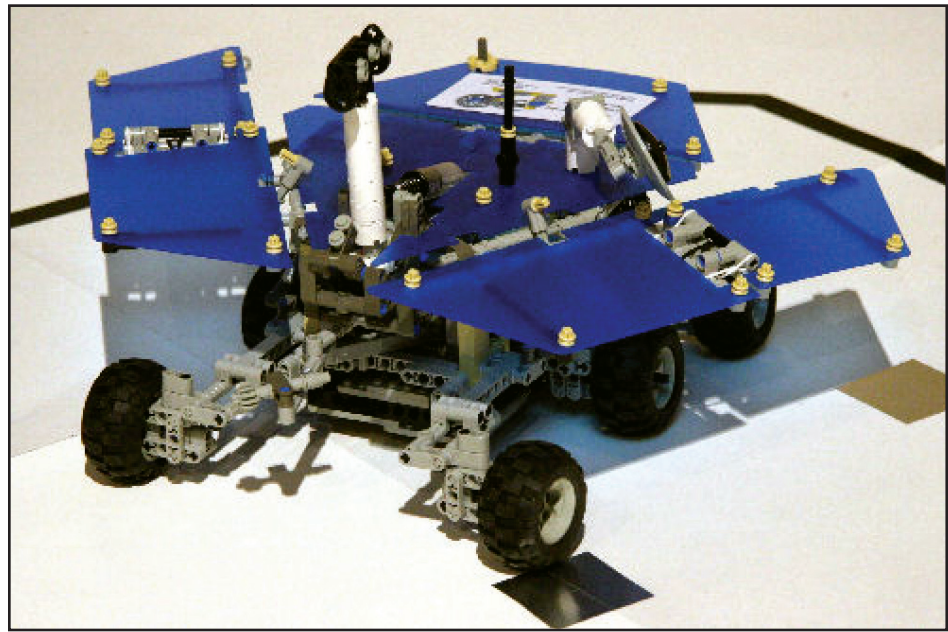
- For more information on RoboGames:
<http://robogames.net>
- For more information on LERN:
<http://legoedwest.com>
- For more information on FLL:
<http://firstlegoleague.org/>

Resources

themed challenge is announced. From “City Sights” to “Ocean Odyssey,” each challenge consists of a series of sub-challenges. Generally, the competing robot will start from a “base” where a member of the team will activate the robot’s program. From then on, the robot will move autonomously through the course, completing as many challenges as possible and returning to base every so often for repositioning and switching out appendages.

Right now, FLL is bar none the challenge to compete in. Teams of up to 10 members build and program a robot over the course of three months before competing in their regional competition. From there, winners advance to the state competition, and winners from that are invited to compete at the national level. It’s an excellent opportunity to get involved in the LEGO robotics community, and it is an invaluable experience for leadership and team building.

There are a huge number of LEGO robotics events springing up on local, nationwide, and even international



levels. While this article lists several of the main constituents of the LEGO robotics world, I encourage you to do your own research and find a program that befits your interests, availability, and needs. At the end of the day, remember that it’s not about whether you win or lose, it’s how you play with your LEGOs. **SV**