THE LOOSE GEARS

Issue II | Storming Robots' Student Publication | June, 2011

Storming Students in International RoboCupJunior Tournament

By Elizabeth Mabrey

For the third straight year, Storming Robots has been invited to represent the USA in the Robocup Junior (RCJ) World Tournament. The 2011 event will be held in the historical city Istanbul of Turkey from July 6th to 11th.

The winning team this year is PI², consisting two 7th graders from Bridgewater township, Andrew Amerman, and Salil Pathare. They will compete against other young students from over 30 different countries including China, Japan and Germany. In addition, they will also have to take on a special challenge to collaborate with another international team to compete with other teams.

"Google – translate tool will come in handy for us," says Andrew. "We will have to create and translate some key phrases to communicate with the foreign team."

The RoboCupJunior-Rescue game involves tasks simulating rescuing victims from natural disasters.

RCJ truly is an extraordinary event which stands apart from other robotics programs for young students. The World Tournament of RCJ takes place in conjunction with RoboCup, which is attended by hundreds of research scientists and engineers from around the world.

Continued on Page 2

Photo by Brian Amerman

Salil Pathare (left), Andrew Amerman (right), the two members of Pi², hold up a congratulatory certificate after winning the preliminary RoboCupJunior competition. The two teammates will represent the United States at the 2011 RoboCupJunior World Tournament in Istanbul, Turkey.

Photo by Ani Pathare

Pi² robot.

It is installed with six sensors and one sensor multiplexer form HiTechnic:

- ⇒ Two light sensors for line tracking.
- ⇒ One touch switch as bumper for both obstacle avoidance and wall tracking.
- ⇒ One Light sensor for victim recognition.
- ⇒ One compass for accurate positioning,
- ⇒ One ultrasonic sensor for obstacle avoidance.

THE LOOSE GEARS

Any accomplishments, robotics creations, and letters are welcome. Send your articles and stories to admin@stormingrobots.com to obtain details.

Storming Robots

Engineering For Kids!

3322 Route 22 West,
Building 4, Suite 402
Branchburg, NJ 08876

Telephone: 908-595-1010
Fax: 866-904-6813

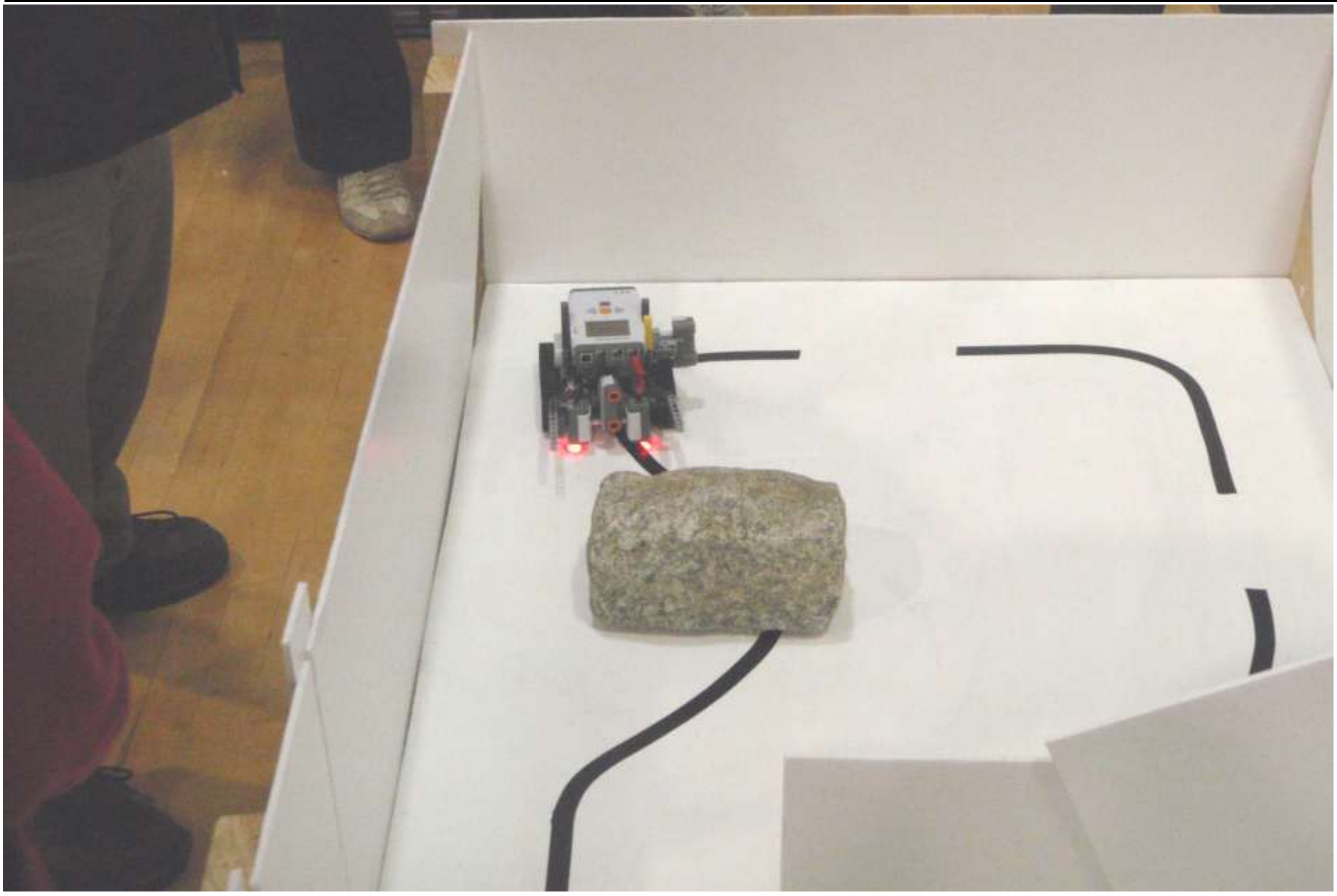


Photo by Brian Amerman

Salil and Andrew's robot navigates its way through the course and around obstacles in the Regional RoboCupJunior competition..

Storming Robots Team to Finals

Continued from Page 1

Interfacing with such researchers and watching their amazing robotics apparati in action truly sparks inspiration and interests in engineering among these young children.

Some of the other competitions and exhibitions include kids-size to adults-size humanoid robots. Also, micro-robots on the order of the diameter of a human hair will be on display facing off in tests of speed and agility.

Being in the international-level game requires the students to work in the field from 9am to 4pm for a minimum of three straight days. If they get into the semi-finals, another one and a half days will be added to their work schedule.

In the 2009 RCJ World event experience at the city Graz of Austria, the Storming Robots team once met 8am in the morning, but did not leave the arena until 8pm at night. After they returned to the hotel, they worked on their project some more. The amount of perseverance they exerted was truly impressive.

Andrew was one of the 2009 participants who have leaned so much from this eye-opening experience. While many of these talented students have continued to take on different challenging projects, Andrew returned to the 2011 RescueA competition, and once again won the invitation to compete at the World Event.

Andrew, along with his new teammate Salil have been ecstatic ever since they were invited to compete at the World Event. They have been spending many hours since Mid-May to prepare themselves and very much look forward to the trip.

Photo by Elizabeth Mabrey

The 2009 Storming Robots team represented The United States in the 2009 RoboCupJunior tournament in Graz, Austria. Andrew Amerman (left) had the honor of competing in the tournament on behalf of USA for a second time this year.

Student Ranks High at the North American Computational Linguistics Olympiad

By Michelle Lu

A member of Storming Robots since 2005, Avery Katko ranked 38 in the nation at the 2011 North American Computational Linguistics Olympiad. He was also one of few members who took a major role at the 2010 MIT/NASA ZeroRobotics Competition and recently was accepted to The NJ Governor's School of Engineering and Technology, a selective summer scholarship-based program for students who excel in areas of math and science.

The North American Computational Linguistics Olympiad (NACLO) is a competition for students aged 13 or older that involves solving problems in linguistics and computational linguistics. It consists of two rounds, called the Open Round, held in February and open for all those interested, and the Invitational Round, held in March. Only the top 20 winners of the second round will be invited to take a completely paid-for summer training camp to prepare for the International Linguistics Olympiad.

What amazes me the most is that Avery educated himself in order to participate in this challenging competition.

I had the pleasure of conducting an interview with him.

How did you get interested in Robotics?

I got interested in robotics after I first saw Star Wars when I was around five years old; I loved the droids.

What's your favorite/best part about Robotics? Your least favorite?

My favorite part of robotics is figuring out how to program intelligent behaviors for the robots, and finally worked disregarding the amount of work. My least favorite part is when robots don't work due to problems out of my control, such as unexpected interference from the environment, or mysterious compiler glitches.

What did you do for the North American Computational Linguistics Olympiad?

The North American Computational Linguistics Olympiad is a competition for high school students in which participants are given several problems involving linguistics and language processing to solve within a time limit.

What kind of problems did you have to solve?

The problems usually give example phrases or sentences in little-known real-world languages with English translations, and ask for translations of English phrases into that language or other phrases from that language into English. I had to figure out how the grammar of the language works from the examples given, and then use the grammar rules to write new phrases in the language. Some other problems were more computational; for some I had to look at outputs from language processing programs and figure out what was wrong with them.

How far did you go?

In the Open Round, I came in 54th place in the United States. There were over 1200 contestants throughout the US. Since I was in the top 100, I qualified for the Invitational Round. In the Invitational Round, I came in 38th place.

Do you have any advice for kids who may want to pursue the same thing?

You can teach yourself a lot of linguistics without any kind of class. I learned a lot from some books I got (*The Cambridge Encyclopedia of Language* and *The Power of Babel* are good) and the internet, especially the SIL website, Wikipedia, and the online conlanging community (people who make up their own languages for fun).

It seems that the program at NJ Governor's School of Engineering and Technology is very competitive. What do you feel helped you become one of the ones chosen?

I've taken calculus and physics classes at the County College of Morris, so that might have helped. I also have a lot of experience with robotics.

What do you plan to do this summer?

They haven't announced the research projects and classes for the summer yet, but I'll probably do something involving robotics or other engineering/technology subjects that interest me.

What do you consider your biggest weakness/strength when considering your achievements?

My weakness is probably my shyness. I also have the tendency to allow myself being overloaded with projects; and end up never finish any of them. My strength is probably determination. I try hard to figure out problems and accomplish tasks when I set my mind to it.

Do you wish to pursue a career in Engineering and Technology?

Yes, I definitely do. I don't know what career yet, but I'm interested in artificial intelligence, so maybe something with that eventually.

-- ☙ --

According to Elizabeth Mabrey, the director from Storming Robots, Avery is truly a role model.

"Avery is a private and very humble individual," she says. "He possesses a great quality most youngsters nowadays seem to lack: a combination of a deep sense of humility along with a high level of confidence. He never advertises himself for his own achievement."

"The level of humility, impressive level of self-motivation, perseverance, and love of intriguing challenge are the gest of the ultimate quality I wish to cultivate at Storming Robots ."

NavLab 5

The Automated Car That Can Drive You Anywhere!

By Michelle Lu

Imagine one day living in a world where your car would drive for you! While you jam to music or play cards, your car safely and quickly takes you to wherever you want to go. With recent advances in technology such as the NavLab 5, this vision may not be too far in the future.

The NavLab 5, developed at Carnegie Mellon, is one of a series of autonomous vehicles, which means the vehicle can drive itself without someone behind the steering wheel. NavLab 5 looks a lot like a standard minivan, but researchers equipped it with computers and video sensors to make it capable of steering itself at legal speeds on everyday roads.

The vision began in July 1995, when research scientist Dean Pomerleau and robotics doctoral student Todd Jochem set off in NavLab 5 to do something that had never been done before: cross the country in a car with a computer doing most of the steering. They entered the 3,000 mile “No Hands Across America” contest from Pittsburgh, PA to San Diego, CA and both scientists would let the car drive itself 98% of the time while the researchers handled the throttle and the brake.

This is how they designed it: they put a video camera below the car’s rearview mirror that would read the road in front of it, recognizing the lane it must follow by imaging lane markings and avoiding things such as oil spots, curbs, and ruts. The images would be processed by a portable UNIX computer workstation between the car’s front seats. After analyzing the information, instructions would be sent back to an electrical, automatic steering wheel. In addition, they added a GPS and gyroscope to help the car locate itself, so it knew where to go. The software used to process these commands is called the RALPH (Rapidly Adapting Lateral Position Handler) computer program.

With such amazing advancements, we may soon see that world filled with cars drive for us.

NavLab, with Dean and Todd

Photos courtesy of cs.cmu.edu

NavLab 5 on Display

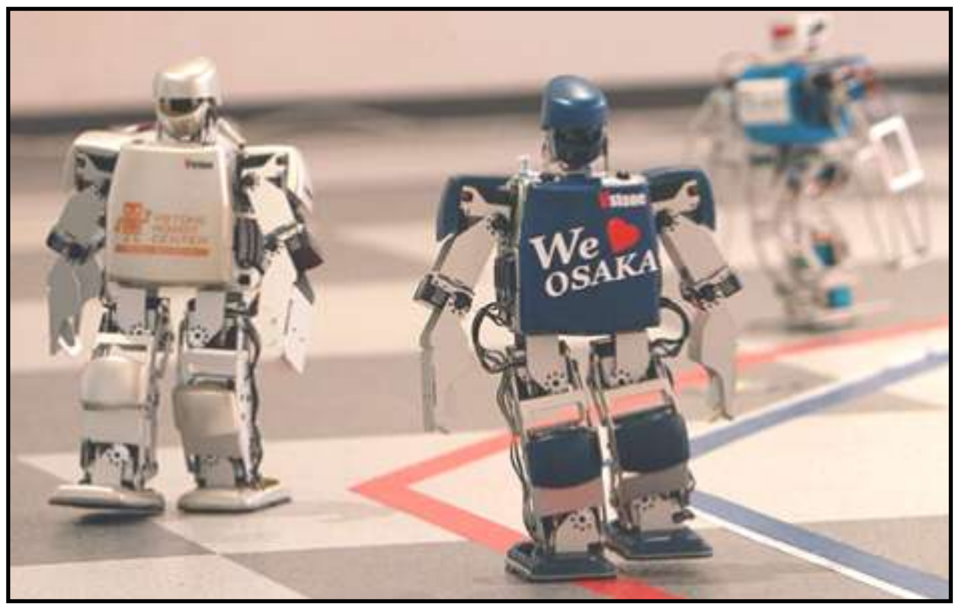


Photo courtesy of AP Photo/Shizuo Kambayashi

Robot Robovie-PC takes the lead during the world's first full marathon for robots in Osaka, Japan.

Robot Marathon Challenge

By Michelle Lu

In a marathon race, tough athletes warm up for running at killer speeds, and excitement and competition are high in the air.

This year on February 24, 2011, the world’s first robotic marathon, the Robomara Full, was introduced to the world in Osaka, Japan. Instead of the fit and strong human athletes that come to mind when you think of a marathon, four fit and well-oiled android robots competed in the grueling 26.2 mile challenge.

Three of the competitors are two-legged and tiny, while the fourth competitor is also small but travels on wheels instead of legs. Built by the Osaka Institute of Technology and a robot-specialized company called Vstone, the robots began to ‘train’ the week before the race, sprinting around a colorful, indoor track for the media and reporters. The event demonstrated the durability and maneuverability of the robots.

The course is a 328 feet long loop, and the robots had to run around the course 422 times, which took four days to finish. The robots are fully automated and even though battery changes and repairs are permitted, the robots had to get up by themselves if they fell down.

On the day of the race, after the start, Vstone’s robots took an early lead, and Osaka’s robots began to waver early on in the race.

After two days, six hours, 57 minutes and 50 seconds, the 16-inch tall Robovie-PC became the first robot marathon winner.

Photo Courtesy of news.discovery.com

Robovie-PC (right) crosses the finish line.

Storming Robots Teams Compete in RoboCupJunior

By Michelle Lu

On April 10th, 2011, the Sixth NorthEast Regional RoboCupJunior robotics competition was held at the Orange High School in New Jersey, with competitors from Canada, Massachusetts, New York and New Jersey.

The RoboCupJunior (RCJ) competition is comprised of 3 categories: Robotics Soccer, Robot Rescue, and RoboDance.

In Robotics Soccer, 2-on-2 teams of autonomous robots play a dynamic, complicated game of soccer, just like a human match of soccer.

In Robot Rescue, the competitors' robots rescue victims in a simulated natural disaster environment.

Photos courtesy of NY1 News

***The Great White Shark* team's robot competes** in the Sixth NorthEast Regional RoboCupJunior robotics competition.

The last category, RoboDance, allows students to be creative and move out of the strictly technical field to make a theme and song for their robots to dance to, along with sensor feedback.

The First-Place team for the RCJ-Rescue Challenge, *Pi-Squared*, consists of two 7th graders that co-captain the team, Andrew Amerman and Salil Pathare.

"It has been a lot of hard work, but also fun," says Salil.

"Not only the technical part is very challenging," adds Andrew, "but also I learned a great deal in dealing with conflict and resolution."

The Second-Place team, *Droidchitect*, consists of members Brian Chung (Gr. 7, Bridgewater), Dhevin Gupta (Gr. 6, Piscataway), Steven Lee (Gr.7, Plainsboro), Bhavik Shah (Gr. 6, Basking Ridge), and Captain Rohan Nagalkar (Gr. 8, Bridgewater). Most of the members in this team were novices, as this year was their first time participating in the event.

The Third-Place team, *R.I.C.K.I.*, consists of members Brian Breslow (Gr.7, Basking Ridge), Ashley Yang (Gr. 6, Basking Ridge), and co-captains Luke Dai (Gr. 6, Belle Mead) and Douglas Rynar (Gr. 8, Bridgewater),

In the RoboDance category, the members of the team "*Lunatic Assassin Droids,*" Tanay Trivedi (Gr. 8, Bridgewater) and Elvin Kong (Gr. 8, Whitehouse Station), received the Best Programming Award.

The team "*Stitch,*" consisting of Brenna Herrity (Gr. 6, Yardville), Colleen McConnell (Gr. 5, Skillman), and Val Post (Gr.6, Basking Ridge), received the Most Innovative Award.

Photos courtesy of NY1 News

Colleen McConnell and Val Post discuss their robot with a reporter. Colleen and Val, along with teammate Brenna Herrity, won the Most Innovative Award for their "Stitch" dancing robot.

Photos courtesy of NY1 News

Fifth graders William Cui (left) and Kushal Patel (right), on team *The Electric Brain*, compete in RCJ-Rescue. Cui and Patel did not place in the competition, but they conducted outstanding work for first-time competitors.

In the RoboSoccer category, the team *The Great White Shark* comprised of 4 members: Ben Brown (Gr. 10, Warren), Matthew Goldman (captain, Gr. 11, Bedminster), Avery Katko (captain, Gr. 11, Long Valley), and Morgan Van-Blarcum (Gr.10, Vorhees). While they designed their software with intricate algorithms, they ran their robot with an innovative holonomic drive system. The team has already started to write a technical paper about their work and will submit it to a technical committee for review.

Congratulations to all of the teams who competed at the Robo Cup Junior!

The Taurus

SRI International's New Bomb-Defusing Robot

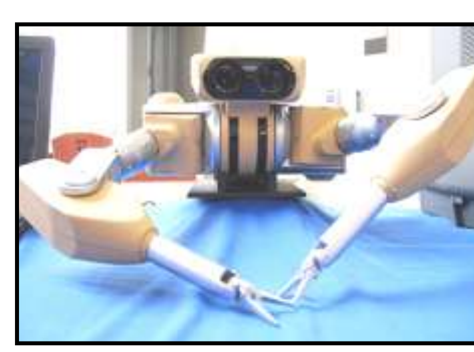


Photo courtesy of SRI International

The Taurus is finally unveiled.

By Michelle Lu

The SRI International organization recently unveiled the new Taurus bomb-defusing robot prototype at a Stanford Robot Block Party at Stanford's VAIL automotive research lab.

Taurus is a small manipulator robot, designed to fold itself into a compact box shape that is 14 inches wide and 45 inches tall. It needs to be small and compact to effectively execute its job — to detect and turn off explosive devices, including bombs, in small spaces in vehicles .

Rather than having its own movable body, the Taurus is intended to be mounted onto a robotic arm of a Talon or PackBot, ground robots designed to clear explosive devices. Taurus's designers constructed it without its own wheels or legs because when working around delicate things such as bombs, robots can sometimes be clumsy.

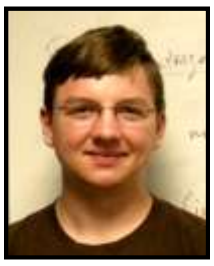
Using Taurus, a bomb disposal technician can see whatever they need to see in HD 3D, and using haptic feedback gloves, clip the red wire while staying a safe distance from the bomb.

The technicians at SRI expect to use the robot heavily in Iraq for use in the military, along with the Talon and Packbot, to effectively and safely detonate explosives and make military missions safer.

The system is expected to be fully implementable in the field by this summer, cheap enough that consumers may be able to afford it.

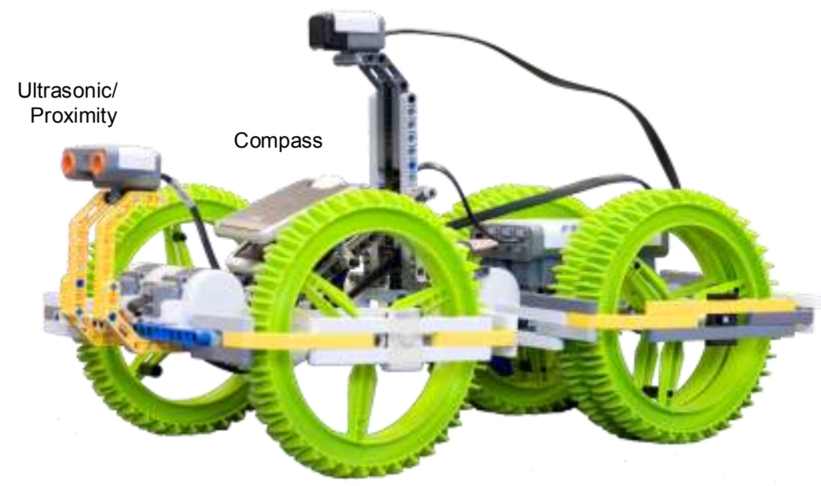
Let us hope Taurus is successful in its wire-cutting mission!

Robot Streaming GPS Data: The Cerberus



By Matthew Goldman

Cerberus is an all-wheel-drive, all-terrain robot assembled by Marc Bruggemann and programmed by Avery Katko and me. Its chassis is heavily based on John Brost's V2 chassis, of which we saw in videos online that inspired us to attempt this project.



Side View of the Cerberus

To operate:

Operation of Cerberus is simple. First, the user places Cerberus at each of the waypoints to which he want the robot to travel and presses a button to store the points to the robot's memory. Cerberus can hold up to ten waypoints, although this is an arbitrary limit. Then the user places the robot on the ground and runs a second program to retrieve the points from memory and navigate to them.

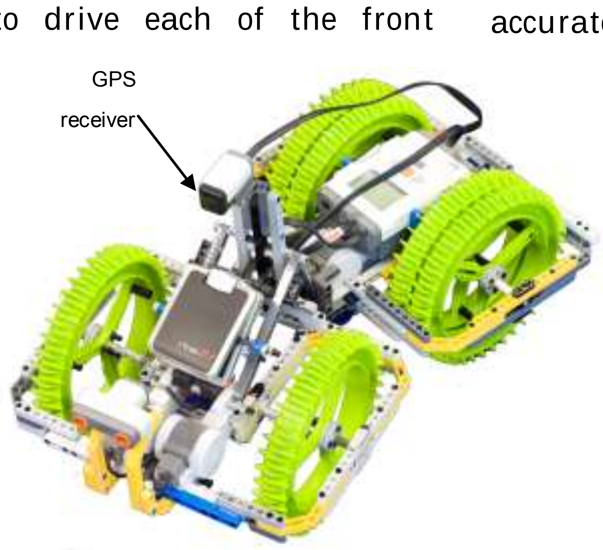
Brief Technical Overview

The robot is named Cerberus, after the mythical dog with three heads, because of the three methods it uses for navigation. First, it uses a GPS receiver to determine its current location. Second, it uses a compass to determine its heading. Third, it uses an ultrasonic sensor to detect any obstacles in its path.

The construction of the robot took around six hours. It uses one motor with a differential to power the two rear wheels and two motors to drive each of the front wheels independently. The front and rear sections of the robot are connected with a universal joint that allows the frame to twist and bend in any direction. This essentially gives the robot independent suspension for each wheel.

The programming of Cerberus took much longer, probably around 36 hours. The robot uses basic trigonometry to calculate the angle and distance between its location and its destination. The robot uses proportional motor control to make a sharper or wider turn depending on this angle, and to maintain a straight path when navigating towards its destination. When the robot reaches a waypoint, it stops, loads the next waypoint from memory, and continues its navigation. The robot navigates around obstacles autonomously.

The robot is mainly limited by the accuracy of the GPS. Although Cerberus can usually determine its position to within one meter, sometimes it is much less accurate, reaching five to ten meters inaccuracy on a cloudy day.



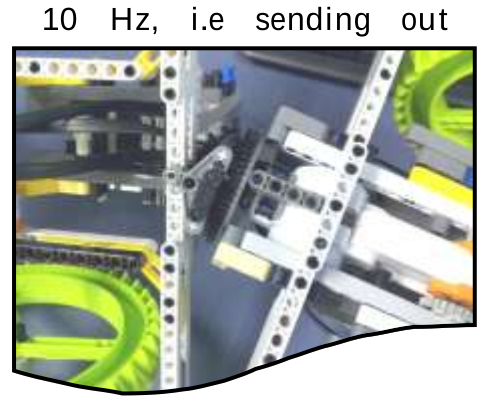
Top View of the Cerberus.

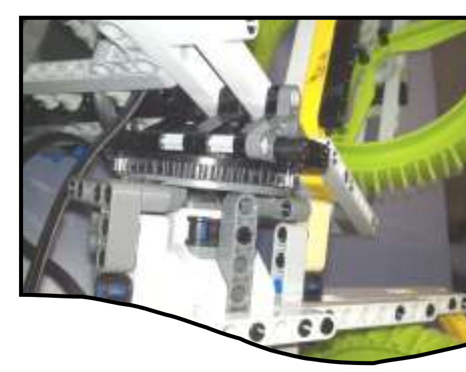
Work on this robot has been spread out over the summers of 2009 and 2010. I have gone through several different GPS receivers and many obstacle avoidance algorithms.

The latest one we've used is the Qstarz BT-Q818 32-Channel Bluetooth GPS Receiver, a Class 2 Bluetooth GPS that offers fast acquisition; the acquisition time is the Time to Fix (acquire satellites' signal) after a cold start. It operates at 10 Hz, i.e sending out signal 10 times a second, twice as fast as the iTrek I used back in 2009. This has allowed the Cerberus to conduct more accurate navigation and find its waypoints in a shorter time frame. Class 2 Bluetooth means within approximately 15 meters signal range. This GPS receiver is not a data logger, so I have to create a simple data logging algorithm to extract the data streamed down from satellites.

However, having to deal with the limitation of the RobotC's poor floating point precision required a bit of work. We had to do some bits shifting in order to get all the precision digits we needed.

Ultimately, however, this project was a great success and one of my proudest achievements.


The universal joint which allows the frame to twist and bend in any direction.


Technic turntable and triangles (hanger-like shapes) form the universal joint module

Holonomic Drive Soccer Bot

by Morgan Van Blarcum

In January of 2011, my robot soccer team decided to create a holonomic drive bot with omni-wheels. I played the major mechanical building role, a really challenging but fun building task.

The 2011 soccer robots were built to fit the requirements of the programming and to obtain a new level of mobility and effectiveness while remaining within a 22 cm diameter circle size restriction.

The goalie robot needed to identify the ball, move in all directions, and be aware of its own position relative to the field. These abilities allowed it to effectively guard our goal and repel the ball to the opponent's side of the field.

The player robot needed to find the ball, find the goal, and avoid becoming stuck on any part of the field. The player was able to find the ball, move itself behind the ball (relative to the goal), and begin an offensive play.

Continued on Page 7

Soccer Robot

Continued from Page 6

The Goalie was built using a quad omni motor base. The four omni wheels, one on each diagonal side, enabled it to move in any direction and thus effectively move side to side in front of its goal. This motor base centered the motors inside a protective ring to which the other components of the robot were built.

On its front was a long bumper, meant to block as much of the goal as possible. To keep it in front of the goal it used Ultrasonic sensors to measure and react to the distance it was from the back and side walls. A compass sensor atop the robot enabled it to face forward and look for the ball. Equipped with these features, the Goalie robot made an effective defense.

The player robot was also built with a quad omni design- able to move in any direction, it was able to react to the ball quickly and efficiently.

However, the ball would often get stuck on the walls and the robot, following the ball, would also get stuck on the walls. To avoid these circumstances the player robot had to be able to identify when it was stuck on the walls. Touch sensors were added to all sides of the robot so that no matter what angle it was facing it would be able to recognize when it was stuck on the wall. With a compass sensor, the player robot was able to identify where it was relative to the goal and make accurate attempts to score a goal.

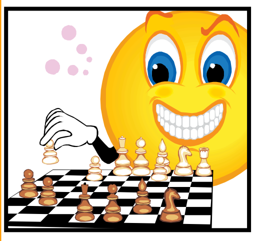

The Goalie bot


The Player Bot with the collision sensor


The Quad Omni Holonomic Drive

Killer Chess Creation:

By Andre Gou



Damascus.Cleaver


Damascus, the Queen

Story:

Once a simple motorcycle, Damascus.Cleaver was beefed up a gut-ripping, metal-tearing motorcycle-saw. In an angry bet with superiors, a mechanic proved that everyday objects could easily be converted into deadly (not deadly, but deadly, deadly) weapons of destruction. The next day, his boss's car was found in cut clean in two halves, with the boss inside.. Night workers reported horrendous metal-on-metal screeching during the night, but were too frightened to investigate further.

The structure surprisingly was not much different from the original, albeit toughened with the amazingly strong, yet flexible, spring steel. The front wheel was replaced with an extra large circular saw, but the teeth weren't made of any ordinary metal; they were made of the long-lost Damascus steel! How in the world the mechanic managed to get his hands on such a material still baffles Scrapping the back wheel for twin booster legs to improve turning, Damascus.Cleaver is as versatile as it is deadly. Any foe unfortunate enough to stand in Damascus.Cleaver's way will be promptly separated into two portions.

The final result did not resemble a motorcycle at all; rather, it was more like a standing circular saw. But deadly it was. In a sick turn of events, the mechanic was found in half, lying face down on his driveway. Damascus.Cleaver was never seen again.

Stats:

Moves: See 'Attacks' s

Attacks: Using its boosters, the rider turns Damascus.Cleaver in one of 8 directions. Revving up the saw, Damascus.Cleaver shoots forwards to the targeted area. If there is an ally in the way, Damascus.Cleaver's emergency brake activates and stops it dead in its tracks. But if it is an enemy... Damascus.Cleaver rips straight through, all of its momentum taken by the impact!

Points: 9

Top.Rider and Bottom.Steed


Rider, the Bishop


Steed, the Rook

Story:

Top.Rider and Bottom.Steed were once a team: Rider and Steed. Together they could travel as far as they could, in any direction, as versatile as Damascus.Cleaver.

Bottom would dominate the 4 Directions and Top would control the 4 Diagonals. But something terrible happened: Bottom.Steed was diagnosed with bone cancer, and the doctors gave him 3 weeks to live.

Growing desperate as each day went by, the pair tracked down every single lead, every single cure, praying for a miracle. And one came, but not what one would expect.

"If you want it put simply, here it is: A cyborg."

They turned to each other. Silent nods. And that is how Steed's limbs were replaced with awesome huge wheels.

"No riding. The wheels cannot support such weight," the cyborg-creator added, quite a while after the operation was completed... "There was a major defect in the structure of ribcage. Riding would shatter it in half. If you want, we can provide you with a complimentary set of clones of each of you. They can be ready in under a week!"

"What is this... I don't even... You son of a second-rate motel maid donkey! We are leaving. Oh, and we'll take the clones. Here's our address."

The Alpha snuck a smile. Ensuring the split of the human's omni-directional weapon would be a huge addition to the ToRAiD's already mounting problems. Although separated, they had doubled. The Alpha didn't think that one through. "Stupid cyborg-creator. He shall be part of the Sunday extermination."

Stats

Moves: See 'Attacks'

Attacks: Through his High-Powered Incendiary Crossbow, Top.Rider can torch his enemies. In Top.Rider's former partnership, he only needed to shoot down the 4 Diagonals.

Points: 3.5

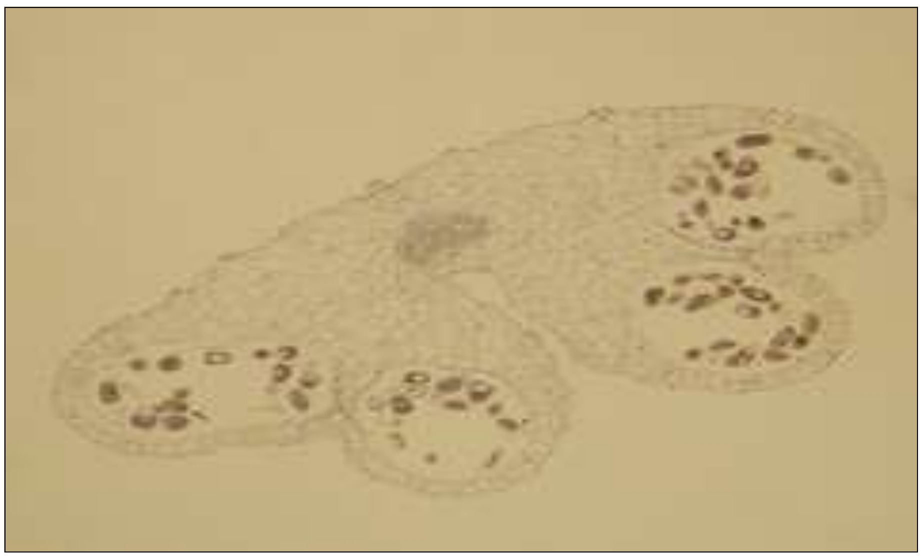
Special: None

Moves: See 'Attacks'

Attacks: Charging horses are dangerous. Charging horses with wheels are DEFCON 1. Watch out for Bottom.Steed in case he decides to come stomping your face from one of the 4 Directions.

Points: 5

Special: Bottom.Steed is not the knight.



Hemerocallis Citrina Mature Anther under microscope

My Microscope

By Howard Hua

One day when I was at Lego Club, I saw a big nanometers chart. It can measure you in nanometers and gives some examples of objects in nanometers, such as red blood cells, viruses and atoms. Since nanometers are so small, how would I be able to see them?

So a few days later, I asked mom if I could get a microscope to build my own laboratory. I can do experiments and study tiny objects through the microscope. Mom always encourages me to buy scientific instruments. So she agreed with my idea. My dad helped me to choose a Meade early professional microscope—high school laboratory quality.

After my microscope came, I ripped the box. I found many parts including the scalpel, the tweezers and the stirring rod, 10 prepared slides and instructions. I connected the mirror with light to the bottom of the microscope, and flicked on the light. Then I took out the slides box with my Dad's help.

I found this really cool slide for "*Hemerocallis citrina mature anther*". Strange big words for me, indeed. My dad told me it was the tip of a lily stamen which holds the pollen.

Hemerocallis is the botanical name for the day lily and comes from the Greek words: beauty for a day.

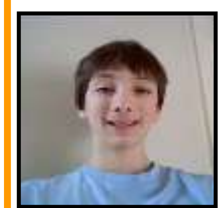
It is fine light yellow powder which may be used as medicinal herbs.

I turned the knob to focus. When I saw it through the microscope, "WOW", I yelled. There are billions of pink oval shapes with a stem on the bottom inside.

A few days later… I finished looking at the prepared slides. Now it was time to make my own slides. I did my onion experiment. I peeled off the thinnest layer of the onion and placed it on the clean slide. Then I dropped red dye around the specimen. Next I used some gum media around the dye and then carefully covered the specimen.

"Done!", I shouted. I now have my slides done!

Watson's Curse



By Eric Ward

It happened on the February 27 with SR-chitect working hard on our RescueB project.

Everyone has had computer problems. There's the blue screen of death, the Windows error, and many others.

On the 27th, a cool but misty day, ominous clouds made 11am in the morning look like evening.

In the midst of having a single program constantly crashing on the NXT, and firmware downloading to attempt to correct the crashing issue, the computer cursor stopped moving no matter how I finagled the mouse and keyboard devices. At the moment of having the pulseless screen staring at me like a deer staring at headlights, I looked around the hardware connections. They all had lights on, so it wasn't a connection problem. We tried turning off the computer. As strange as it sounds, it was already off. The on/off LED light was off! The monitor had power, but the computer didn't!?

To make things even more strange, our attempt to download our program to another computer put it into its comatose state.

With desperation, we decided to just use Andre's computer, as his has always worked.

But then, the attempt to download the same program has left its USB port non-functional!

Another attempt bites the dust.

Now, I love to take freaky event like this as an opportunity to entertain myself; and I would like to share my modified story with you. I call it the Watson's Curse.

(Note: *The rest of this is a fiction.)*

As I kept thinking, I decided that a person had to be causing this, or a very smart computer. A very smart computer…what did that remind me of? I gasped. But before I could react, the lights turned off and my frozen monitor changed from my program to a spherical design; a spherical design commonly known as Watson, IBM's super computer.

"Hello Eric," Watson said.

"Oh my god, I knew it," I said.

"Is that Watson?" Michael asked as he backed away from the computer.

"He's been messing with our robots guys," I shouted. I began to back up towards the door.

"Where are you going Eric?" Watson asked.

"Open the doors Watson," I stammered. We were walking faster now.

"I'm sorry Eric. I'm afraid I can't let you do that," Watson turned red. The computers in the room broke apart and the wires flew out, grabbing everyone in the room. I jumped out of the way, avoiding the wires. I jumped under Watson's monitor, and began to take apart wires.

"What are you doing Eric," he said nervously. I continued to take apart the wires. "I'm sorry Eric," He said. I took out another wire. "Stop," His vocabulary began to decrease. "What is leprosy?" He began to just recite from his memory. His grip on the people in the room relaxed. "I'll wager $1,635. Same category for sixteen-hundred…Toronto… G-7... Dai-sy,.. Dai-sy..." Finally the screen went blank.

Engineering: An Evolutionary Force

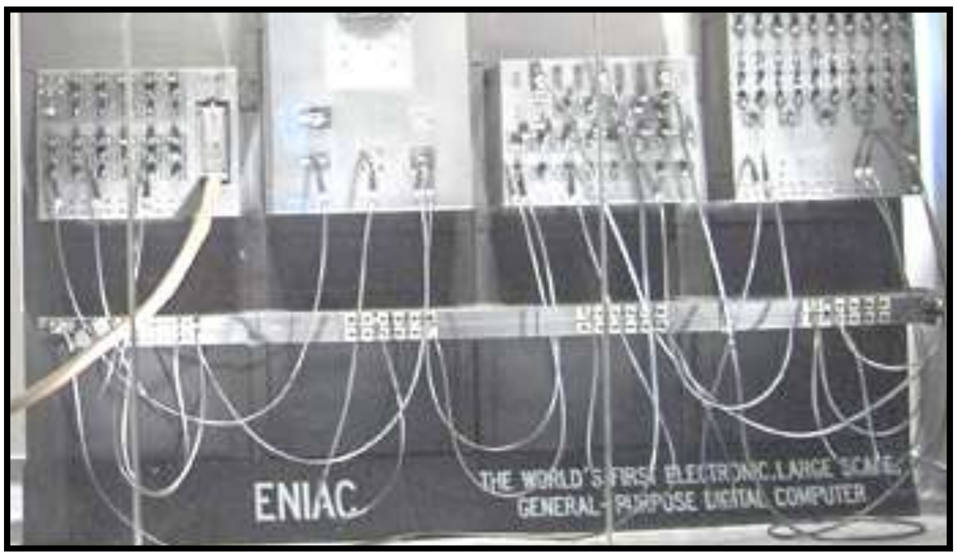


Photo courtesy of en.wikipedia.org

The ENIAC, photographed around 1946

By Tanay Trivedi

Engineering– a very powerful force that can change nations and civilizations. Upon hearing "engineering," many automatically and mistakenly think of some granite slab from space, like in "2001: A Space Odyssey."

The American Engineers' Council for Professional Development defines engineering as "the creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property."

Everything has to be engineered. The paper this article was printed on was first engineered in China thousands of years ago. The ink that was used to print this article was first engineered in Medieval Europe.

The first general-purpose electronic computer, an ultimate revolutionary invention, was engineered by the School of Engineering in 1940s at the University of Pennsylvania —the Electronic Numerical Integrator and Computer (ENIAC). This artifact is still on display in the Penn Museum on the University of Pennsylvania campus.

Engineering is the driving force of human nature and life. In fact, without engineering, we wouldn't have had bone clubs and stone axes back in the Paleolithic Times. The way people work to move forward- to get whatever they need to get ahead. During the Cold war, the United States invented the first nuclear submarine that fired a ballistic missile underwater, and immediately the Russians tried to catch up.

And logic of engineering in the modern day is very simple.

Suppose, a scientist must find out how to power a humanoid robot with muscles. There are many things he can choose from.

For example, he could use hydraulics for their sturdiness, as they were used in World War 2 as controlling factors. He could also use electric coils, because when a current is supplied to them, they contract immensely. He could also use pneumatics and vacuums technology. Vacuums are very powerful, as they harness the power of the airless void to provide forces.

Now, these are very low grade methods basically meant for hardware. For computer software, you must look inside for inspiration.

The idea of computer software is very unique and replicates functions that occur in the human brain. It involves three steps: input, process and output.

Let's take the eye for example. The eye imprints the image of what is going on in front of you on the retina

Continued on Page 10

My Cousin Hayley's I.S.E.F. Project

By Herman Zullow

My cousin, Hayley Zullow, goes to Ossining High School in Westchester, New York. She is in twelfth grade. She likes science. For the last few years she has been working on a very special science project called ECAT11 Plays A Role In The Epigenetic Regulation Of Retrotransposons.

I did not even know what the name of the project meant so I called Hayley and asked her. She told me that retrotransposons are jumping genes, which jumps from one DNA strand to another. It can also jump from spot to spot on a single DNA strand. Jumping genes jump more in cancer cells so some people think that jumping genes cause cancer by causing changes in DNA sequences.

My cousin Hayley worked in a lab for more than two years researching these jumping genes. She started her research in tenth grade. She worked in Dr. Timothy Bestor's lab for genetics and development at Columbia University Medical Center. The lab was trying to figure out why jumping genes jumped around and look for ways to stop it as a cancer therapy. Hayley's project was to study a type of protein called ECAT11 and see if it could be used to stop jumping genes from jumping. Hayley's research showed that ECAT11 could be used to stop jumping genes. The next step is to see if that protein, ECAT11, works in cancer cells and to see if you ECAT11 to cancer cells to stop cancer.

Hayley's project was chosen as a semi-finalist for the Intel Science Competition. Seven other students were chosen as semi-finalists from Hayley's school. Only one other school in the country had eight semifinalists, Bronx School of Science. The science program at Hayley's school is run by Angelo Piccirilo and Valerie Holmes. They sound like very good science teachers.

Hayley was a semi-finalist in the Intel Science competition but she did not make it past that. However, she did win first prize for her category in the Westchester/Rockland county science competition, so she is going to the state finals in March. I hope she wins.

A Military Robotics Scout Plan

By Andrew Chen

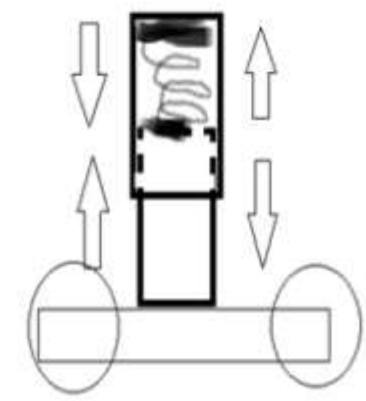
When you think about military operations, you probably will think of *BANG, BANG, BOOM*. Although you might have a good point, armies also need to gather good intelligence. Without lots of accurate intel, attacks will most likely fail. Scout teams often need to travel across rough terrain, but the R-1 Centipede is up to the task.

The Centipede has a 40 to 8 to 24 tooth gear system, giving it 4.8 times the speed of the motor for average speed. The Centipede has six wheels, three on each side. The four front wheels are connected to the main body by Legos with springs in them, to help traveling over rough ground.

When the Centipede has to travel over tilted ground, the springs will let one side go up, and the other down. This allows it to take a more direct route to the target than other reconnaissance vehicles.

Sensors are other vital pieces to making a successful scouting robot. The Centipede has a thermal camera on the left side, a touch sensor in front, and a video camera on the right. The video camera has a 1.6 terabyte flash drive attached to a USB port, and there is a 1.2 terabyte flash drive on the thermal camera.

Many reconnaissance robots have been made throughout the times, but the R-1 Centipede scuttles past them all.



The spring-design on the Centipede, helping the robot to travel in a desirable path

The Mighty Beanz

By Hugh Zhang

Mighty Beanz is a kind of toy that is shaped like bean that can roll, flip over, and race on vehicles.

There are a lot of different kinds of mighty Beanz: Star Wars, Spider-man, glow in the dark, special edition, vehicles, etc. While some are common, one must fill out an online order or search really hard to find the extremely rare "Mighty Moose Beanz."

There are many different play sets with Mighty Beanz. You can buy a pack of six beans, a pack of three beans, the Mighty Bean vehicle set that comes with one Bean and one vehicle, the collectors booklet, the trick stick or the Mighty Bean racing play sets.

There are many different series in Mighty Beanz, including the farmyard series, historical series, underwater series and many more, such as "Star War" Mighty Beanz. There are five beans in a series, including one ultra rare bean, one rare bean and three common beans.

Mighty Beanz flip and roll with the help of a little magnet ball inside each plastic Bean. Without it, the bean would just slide instead of flip over. The magnet ball. With the toss and turning of the magnetic pole, it forces the bean to flip.

Mighty Beanz can do all sorts of tricks. For example, after standing a Bean up, pinching it will cause it to roll over. There are more than 20 tricks you can do with Mighty Beanz.

There are many other games you can play with Mighty Beanz. For example, if you want to play Mighty Beanz hockey, you need two trick sticks and one mighty bean to be the puck. You can also make your own Mighty Beanz game with your Mighty Beanz and play sets.

The future of Mighty Beanz looks really bright. Almost every toy store you go to probably has Mighty Beanz. There are more than 1,000 Mighty Beanz, and the company is still making more Beanz! Some Mighty Beanz series are already ranked among favorite hobbies games and toys, and it is still growing.

Engineering

Continued from Page 9

and then is transferred to the optical nerve. The optical nerve transfers the image to the brain, thereby concluding the *input* step.

Then the brain *processes* it by analyzing the image with a set of rules intrinsic to our nervous system.

It then *sends the output* to a muscle, which then moves according to the brains instruction. So, in the end, the brain has to perform input, processing and output.

I am currently typing up my article right now. My eyes are continuously scanning the screen, looking for any anomalies in my typing. Suddenly my eyes, while scanning the page, happen to notice something in its retina and sends the image back to the brain along with the others. The brain receives it through the optical nerve and processes it. The brain scans through the image and sees and anomaly: *Oh, there's a typo*. So, it outputs a signal to the muscles, ordering them to move with the control keys to the spot. The fingers manipulate to hit the backspace button and push it, the fingers replacing the missing words with the words the brain dictates.

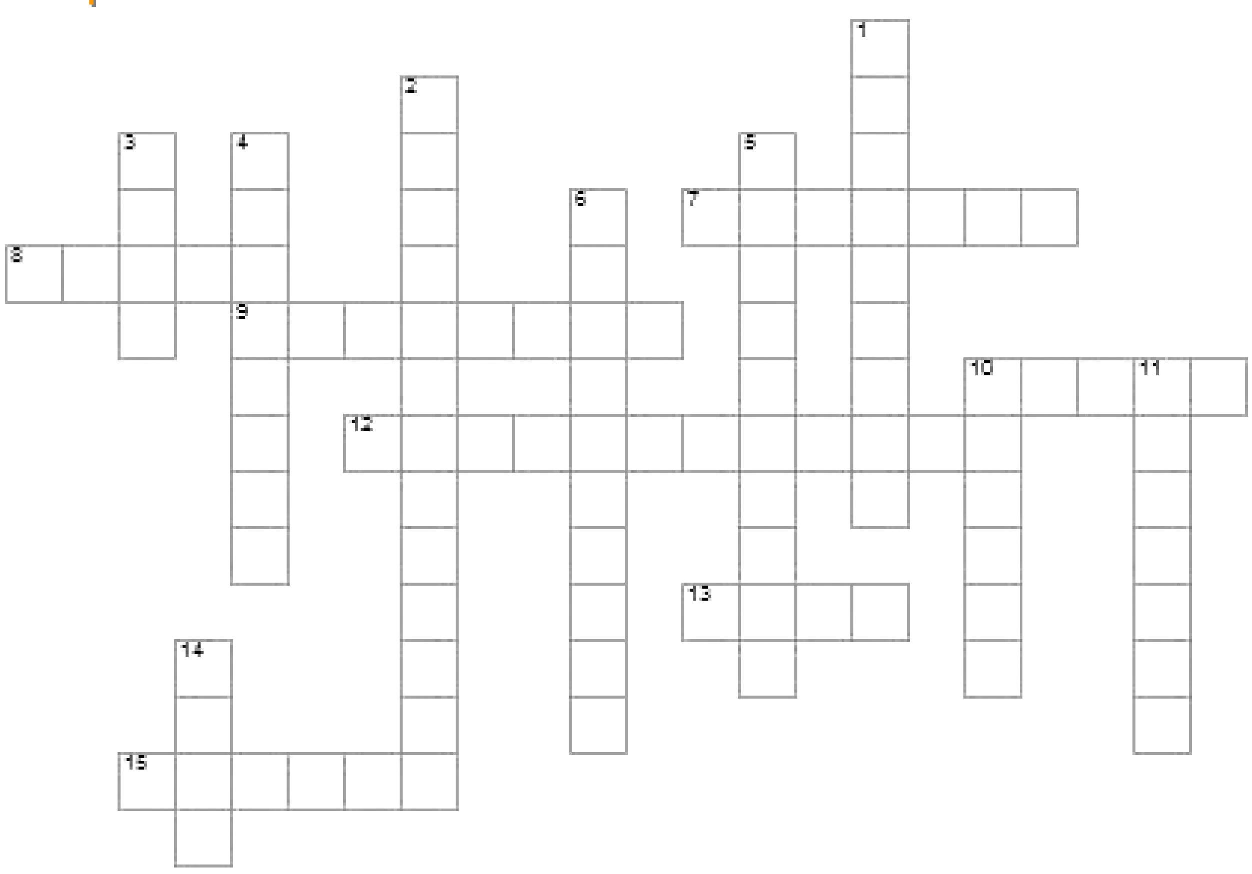
Basically, a computer works the same way. The computer examines the words typed by the user. The words are sent to the processor, which scans through a list of directives for spelling and grammar. And it sees a typo. It sends a signal to the screen, (the output) which underlines the area in red squiggles. It is a very intriguing and intrinsic design.

If an engineer has to look back in time for information, who was the first inventor and what did he have to look at for inspiration? I don't know who the first inventors name (sorry, australopithecines didn't record names) but when the Australopithecus evolved into Homo habilis, humanoids started to use tools like bone clubs and stone axes. How did they know, I'm not sure, but , it wasn't a granite slab from space like in 2001: A Space Odyssey, but perhaps simply original minds of early engineers.

In the next issue, Tanay will write columns about various disciplines in Engineering, impact to our society , and possible career path.

By Elizabeth Mabrey

Simple Mechanics



Down

1. _____ is the relationship between the numbers of teeth on two gears that are meshed, or the circumferences of two pulleys connected with a drive belt.
2. A servo motor has a position-sensing device called _________.
3. A _____ is a shaft or rod on which a wheel turns.
4. In a two gear system, when the driver is the smaller gear, the output force of the driven gear is __________.
5. An electric motor converts electrical energy into _____energy.
6. In a ____ control system , a sensor monitors the system output, (e.g. car's speed) and feeds the data back to a controller which adjusts the control (e.g. output power) as necessary to maintain the desired system output (e.g. the desired position).
10. In a two gear system, when the driver is the smaller gear, the larger gear turns ________.
11. A lever consists of a rod or plank that pivots on a ________.
14. ____ gears are required in applications where drastic speed reduction is required.

Across

7. A _______ is used in such application where the input speed is converted to a known output with reduced RPM and increased torque. They have a combination of gears of different sizes along with axles and gears.

8. An ______ is a mechanical device that is secondary to the main transfer of power in a mechanical system, but does not contribute to the final gear ratio.

9. An _____ controller is a system where no measurement of the system output (e.g. the car's speed) is used to alter the output (e.g. the car's position/rotation).

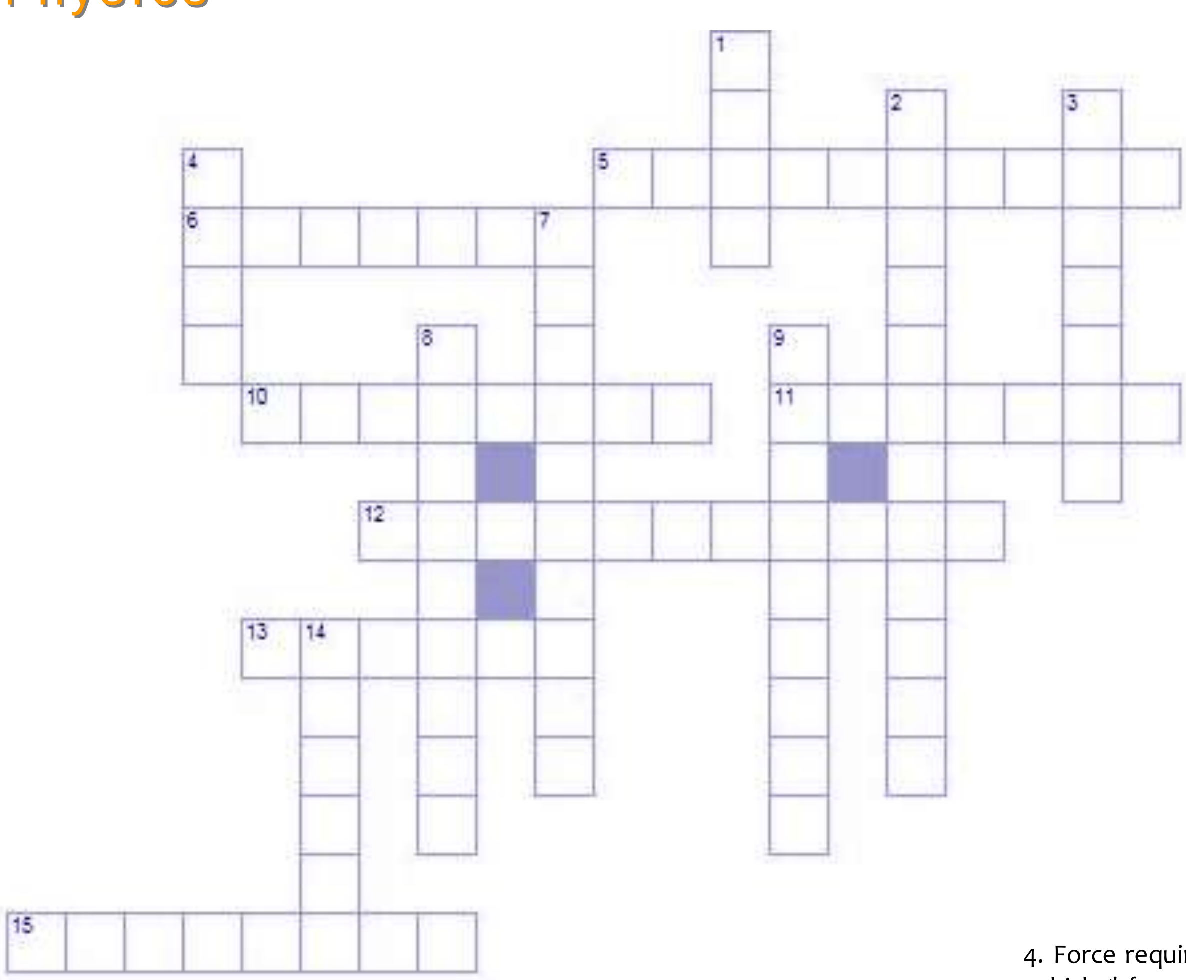
10. ____ is another term of axle.

12. This is a device capable of transmitting torque and rotation through three shafts, receives one input and provides two outputs—this is found in most automobiles—and in the other way, it combines two inputs to create an output that is the sum, difference, or average, of the inputs.

13. For a gear ratio of 1:2, it means the driver gear turns ______ times the driven gear does.

15. A ____ is the wheel or gear that transfers force to other wheels or gears.

Physics



Across

5. _______ inertia means a body that is set spinning has a tendency to keep spinning in its original orientation."

6. Analogy: In linear motion, velocity = change in distance/change in time. In Rotational motion, _________ velocity = change in angle/change in time.

10. momentum = mass * _________ in an idealized frictionless system.

11. Law of _________ = Every object remains in a state of rest or of uniform motion in a straight line unless acted upon by an outside (net) force."

12. The push or pull on a moving object toward the center of its curved path. _________ force is a net force.

13. One ___________ force is produced by acceleration of 1 kg of mass 1 meter/s2 where s2 means second squared.

15. ______ = inertial mass * velocity

Down

1. When a force acts upon an object to cause a displacement of the object, it is said that _____ was done upon the object.

2. Force = mass * _____________.

3. The ________ energy of an object is the energy which it possesses due to its motion.

4. Force required to lift a car uphill = degrees of the slope * _____ of the vehicle * force of gravity.

7. _________ is another name for "load".

8. ________ energy is the energy stored in a body or in a system due to its position in a force field or due to its configuration.

9. A major difference between a vector quantity vs. scalar is that vector consists of _________, but scalar does not.

14. ____ is the force (push or pull) that produces an action.

Prime number Generator — The Sieve Algorithm

- By Elizabeth Mabrey

We all know that a prime number is a natural number (>1) which has only two distinct natural number divisors: 1 and itself.

According to Britannica Encyclopedia, the world's largest known prime number is almost 13-million digits long, and found by an electrical engineer named Hans Michael Elvenich on the 6th September of 2008. :

$$2^{43,112,609} - 1$$

One typical important use of prime numbers is in cryptology, such as encryption technology.

Prime number generator algorithm

One typical ad-hoc method (no optimization, somewhat makeshift solution) :

⇒ Let P stands for any number from 0 to max X.
⇒ 2 is prime by default.
⇒ For each odd number
⇒ P_3 to P_x = 0 to X
⇒ assume all are prime
⇒ For i from 2 to $\sqrt{X}$
⇒ If P_i divisible by i,
⇒ it is not prime

This ad-hoc prime number generator is very slow. In this manner, it takes over 0.321 seconds for a 64-bit /i7CPU /1.73GHZ machine to generate all prime numbers under 1,000,000 and more than 2.5 hours to generate all prime numbers under 10,000,000.

Sieve of Eratosthenes (≈240BC)

In Mathematics, the Sieve of Eratosthenes is a very simple, ancient algorithm for generating all prime numbers up to a specified integer.

The algorithm is very simple.

⇒ set P_0 to P_x = Ø under X, where X=the max
⇒ for all positive integer values of i*j, such that i * j < X, set $P_{i*j} = 1$
⇒ For those N_k = Ø, k = prime

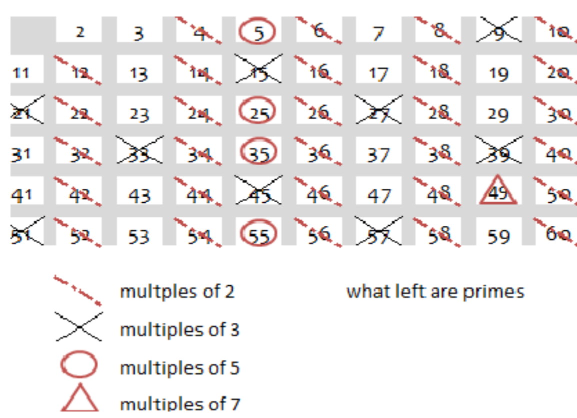


Figure A: Demonstrate Sieve Algorithm under 60.

Notice that each number only has two states, i.e. 1/0 or non-prime/prime. Figure A illustrates how this algorithm works for number under 60.

On the same machine, it took 0.024 seconds to generate all prime numbers under 1,000,000, and less than .23 seconds to complete those under 10,000,000.

A bit of optimization needed when programming this

The biggest problem is the limitation in the memory capacity, and only using a super computer and very sophisticated mathematical number theory to handle such huge number.

If you are interested in playing with this, you will need to do a bit memory allocation trick.

Since each integer only has 0/1 (prime/non-prime) states, you will want to use binary representation, i.e 1 bit for 1 integer. So, 10M integers representation will take up only 1.25MB (10,000,000 / 8) instead of 40MB (as 1 integer usually takes up 4 bytes).

For handling huge numbers, one way is to deal with only unsigned data types, e.g. signed "int" allows max $2^{31} - 1$, (2,147,483,647) while unsigned "int" allows max $2^{32} - 1$ (4,294,967,295). Some machine will allow 64-bits "unsigned long" , up to $2^{64} - 1$.

Modern sieves are much more sophisticated. For those who are interested in learning more about prime numbers, visit: http://primes.utm.edu/mersenne/.

Special Notes

Home :	**http://www.stormingrobots.com**
Center Calendar:	http://cal.stormingrobots.com
Summer site:	summer.stormingrobots.com
Twitter:	www.twitter.com/stormingrobots
June 15th:	Form 2011 First LEGO League teams. Must review online details about expectation. www.stormingrobots.com/prod/competeQnA.html Contact admin@stormingrobots.com if interested.
June 19th:	2011 Spring Roboclub Ends. Roboclub Recess during July and August.
July 1-6	Compete at the RobocupJunior/Rescue A World Tournament in Istanbul, Turkey
Jun 27th-Jul 1	Week 1 of Summer Workshops
July 2nd—10th	Center Closed
July 4th—Aug 26th	Week 2 to 8 of Summer Workshops
July 15th	2011 Fall Roboclub Registration—for Returning Members Only
Aug 8th	2011 Fall Roboclub Open Registration – for New Members
Sept 7th	2011 Roboclub Fall Term Starts
Oct	First time USA Computing Olympiad Participation

Storming Robots LLC

Contacts List:

Phone:	(908) 595-1010
Fax:	(866) 904-6813
Editor-in-Chief:	Michelle Lu
Columnist:	Andre Gou
Editing/Layout Consultant:	Garrick Lau

Many THANKS to Garrick for his advice and editing assistance. He was the Editor in Chief at his High School award-winning newspaper. He is currently majoring in Mechanical Engineering at the Cornell University.

Center Director:	Elizabeth Mabrey
Center Administrator:	Michelle Metallo
Email Contacts:	*<firstname>.<lastname>*@stormingrobots.com

QR code to reach our website: http://www.stormingrobots.com

QR code to call us at (908) 595-1010

Call for Interests

Looking for Columnists.