THE LOOSE GEARS

Storming Robots

Engineering For Kids!

Issue IV | **Storming Robots' Student Publication** | October, 2012

Storming Robots Leaves Mark at International Competitions

Michael Xie From SR-chitect waving American flag at the World Event

By: Mrs. Elizabeth Mabrey
Edited by: Tanya Glushkova

This June, Storming Robots' students representing The United States of America to compete at the International RobocupJunior, an AI-oriented robotic tournament, in Mexico City from June 18 through 24. Our teams ranked high in this World Championship competition. Our techno-wizards, mostly rookies, performed brilliantly against an intensely competitive field of teams from countries around the globe including China, Japan, and Germany.

- Full article on page 6

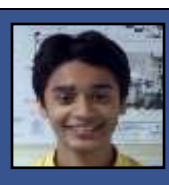
Won The USA MIT/NASA — ZeroRobotics Satellites Automation Tournament

ZeroRobotics Championship Plague from MIT/NASA

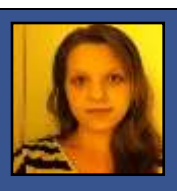
By: Mrs. Elizabeth Mabrey

A team of five high school students from Storming Robots won a worldwide space robotics competition on January 23rd in 2012. The Zero Robotics SPHERES Challenge, held by MIT and NASA, took place aboard the International Space Station (ISS). The teams were tasked with writing software to control experimental volleyball sized satellites used by the astronauts. Every team was able to watch the entire event on Earth through a live feed from the ISS via NASA TV.

- Full Article on Page 8



Nikhil Shah
Editor-in-Chief
Grade 11



Tanya Glushkova
Co-Editor-in-Chief
Grade 11

Attention!

- **Send us shout-outs, accomplishments, and articles!**
- Send us your own comic strip.
- Write us an article about your interest, with topics like science, technology, your favorite school events , or anything in your interests.
- Email to admin@stormingrobots.com to obtain details in requirements.

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Interview with our Graduated Roboclub members — Avery Katko and Mathew Goldman

By: Tanya Glushkova and Elizabeth Mabrey

Avery Katko and Matthew Goldman
Both received the most prestigious award from the Rutgers University - The Presidential Scholarship Award.

Many of roboclub members know them as their own instructors, and if not, then they have at least heard of their accomplishments, hard work, and intellect. Avery Katko and Mathew Goldman are two Storming Robots students that have left an impact here.

Both started robotics seven years ago, and have since taken part in many competitions. They have even mentored their own teams through competitions. After 7 years full of adventures and fun times at Storming Robots, Avery and Matt are on their way to college.

I got the chance to interview them before they left.

Q1: Which university are you attending this Fall? What major(s)?

Avery: I am attending Rutgers University. I'm thinking of doing either a double major in computer science and linguistics, or a triple major in computer science, linguistics, and math.

Matt: I will be attending Rutgers University, majoring in computer science, probably double majoring in math.

Q2: What are some memorable moments at Storming Robots?

Matt: Coaching an FLL team that won the Teamwork award at the state competition, and winning ZeroRobotics.

Continue below...

Continue from above ...

Q3: What was the best and/or most useful thing you learned here?

Avery: How to troubleshoot.

Matt: Programming Techniques and comment your code.

Q4: How have you used what you learned at Storming Robots in your life/ school work?

Avery: I've used my robotics knowledge I learned here while working as summer workshops instructor, and mentoring RobocupJunior teams. Also I've used it at home in various hobby programming projects.

Last summer when I was at the Governor's School, my research project was on brain-computer interfaces. My software knowledge collected at Storming Robots has definitely helped me to process E.E.G. data and compare brainwave readings from different parts of the brain. And obviously I will be using what I've learned here a lot in computer science classes in college.

Matt: I'm studying computer science in college, so I'm sure I'll be using many of the programming techniques I've learned at Storming Robots every day.

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Both Avery and Matthew were accepted into multiple prestigious universities besides Rutgers, including Cornell University, University of Pennsylvania, Carnegie Mellon University, etc.

They are also awarded the Presidential Scholarship from the Rutgers. This is the most prestigious merit-based scholarship award Rutgers offers undergraduates — a full-ride scholarship.

Most top colleges do not offer merit-based scholarship. Matthew said, " I have decided that it is not worth to put myself over 100K in debt by the time I graduate from college." Avery said, "It is not worth it. For example, U Penn, it will further reduce my grant, because of my other scholarships received from external sources."

Both have expressed the desire to further their graduate school studies. Avery even started to look into various graduate school offering robotics and linguistics, one of his greatest passion in technology.

From the Rutgers University's Undergraduate Admission Website:

"The Presidential Scholarship is the most prestigious scholarship award Rutgers offers undergraduates. Awards are $24,000 per year, and include a $11,500 credit for on-campus housing and dining. For those who choose not to live on campus, the award will be $12,500. Students are guaranteed on-campus housing for four years and admission to the Honors Program. To be considered, students must have at least 2250 combined SAT or an ACT score of 35 and an A grade point average. "

In the year of 2009 and 2010, two of roboclub members have also been awarded the same Presidential Scholarship from the Rutgers University.

Evaluation Report for our Roboclub parents and students

As always, students will receive a report reflecting their work habit at the end of Fall and Spring Term.

In the Spring-2012, we started to add a technical report to reflect their accumulative skill levels. The goal of this is four -fold.

One is to serve as a feedback to parents and members.

Two is to provide a way for students to gauge their skill levels.

Three is to provide students inspiration as for what's next they may advance to.

Four is to serve as a guideline for technical and work habit requirement for entering competition with SR.

Continue on P. 5 ...

Interview with RCJ International 3rd Place Winning Team member — Vadym Glushkov From the Dimensions Team

By: Tanya Glushkova

A big congratulations is in order to all the Storming Robots teams who competed in Mexico.

They have all been working extremely hard and they did a great job at the competition. Representing the US in the RoboSoccer Division was the Storming Robots team: The Dimensions. Luke Dai, Sunny Agarwal, and Vadym Glushkov won 3rd place after months of hard work.

I interviewed one of the members, Vadym Glushkov, to get his thoughts on the competition.

Q: When you first started participating in the RoboSoccer how did you approach the competition?

A: Originally we all just wanted to do the best we can. We split up the tasks and worked together to complete the robot and program it. Everyone was so surprised and happy when we made it to Mexico.

Q: How did you prepare for Mexico? What did you change from before?

A: We didn't really know what to expect, and we tried to prepare for anything. We were planning to change the structure of our robot originally, however, due to lack of time, we decided against it. Instead we worked to clean up the code, making it faster and more efficient. We braced out robots to make sure that they would survive the plane flight and the competition. We added more advanced sensors to increase our chances of winning.

Q: Are you going to do this next year? What lessons have you learned from this competition? What advice would you give to someone about it?

Vadym Glushkov

A: Yes I know I will definitely participate next year. It was a great experience and I had a ton of fun! I would say the most important skill that I learned is to be confident in my work. For example, when something goes wrong, pretend that it was on purpose! Seriously though, it is important to remember that actually winning or losing is a very small part of the process. Learning to build and program our robots, learning to be responsible for our own work, and working together with a team, is what it really is about.

Storming Robots Mentors at NJ Governor School

By: Nikhil Shah

And Elizabeth Mabrey

Storming Robots recently played a part at the New Jersey Governor's School for Engineering and Technology (NJ-GSET) 4-week intense program. I was the assistant mentor for a project team that Mrs. Elizabeth taught during the 2012 Summer program.

Storming Robots has been a part of this program since 2011.

A snippet of information about the NJ-GSET. The NJGSET was held at the New Brunswick campus of the Rutgers University. It is an intensive residential summer program with no cost to students' families. Students accepted into this program are some of the most talented and highest academic achievers from NJ high schools. All students applied to this program are graduating junior year In order to be accepted into this program, students must be nominated by the school counselors or administrators. For full application process, I highly recommend you to contact the NJ Governor School at this site: http://www.soe.rutgers.edu/gset.

During the program, students will collaborate with two to four students on various research and technologies projects. Program is always concluded with a conference-style symposium where students will present their final paper and on-stage slide presentation in front of hundreds of invited guests.

Throughout the four weeks, students will attend a variety of life-skills workshops, onsite visits to various high tech companies such as Lockheed Martin, or financial corporations like Morgan Stanley. In addition, they will also select from over 15 researches and technologies projects.

Regarding the project which I assisted in, the goal of the project was to have a GPS receiver connected to a robot, that could figure out where it was based on its latitude and longitude. The robot would figure out how to route itself to a pre-determined target point.

To accomplish that, Elizabeth provided them scaffold project plans with increasing levels of complexity to guide students from start to finish. Students not only had to learn how to program a robot to self-aware of its location by streaming its own positioning data via a GPS receiver. They also enabled the robot to be controlled remotely via wireless communication with Bluetooth as well as XBee Technology.

Initially, the project team used Bluetooth, but this wireless technology has a very short range, only up to 10 meters. In order to allow longer range, the project team had to add in XBEE device. XBee device uses radio wave wireless communications technology that has a much longer range up to 100 feet which allows for the robot to be controlled from the remote controller

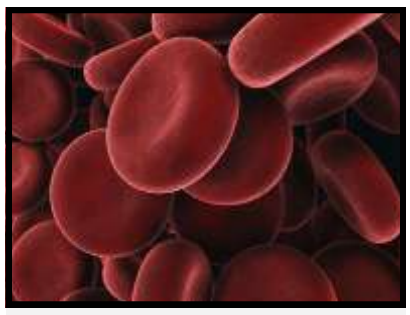
This project was very involved in technical aspects. Some of the team members started without any programming background. In additional to the regular class work and corporations tour, these Governor School project teams managed to put in over 60 hours throughout the short 4 weeks to complete this project. It was truly impressive.

2012 NJ GSET Group (from the Rutgers Office of Students Development—http://www.soe.rutgers.edu/gset

My experience assisting Mrs. Mabrey with the GPS Hide and Seek project and the NJ Governor's School of Engineering and Technology was stellar by all measures. Not only did I get to meet interesting students, but I also got to work on an exciting multi-faceted project that. I helped the students use RobotC and work with a third party GPS. It was very rewarding."

Oxygen Injection

By: Nikhil Shah



Red Blood Cells
www.howstuffworks.com

Oxygen is one of the most vital compounds to living organisms in the world. It provides immediate energy and allows the brain and other key organs in the body to function. Oxygen is transported in the body via the circulatory system. In the emergency room, when someone cannot breath, every second is valuable when saving his or her life. If oxygen cannot get to the brain for a prolonged period of time, then the person will not have good fortunes.

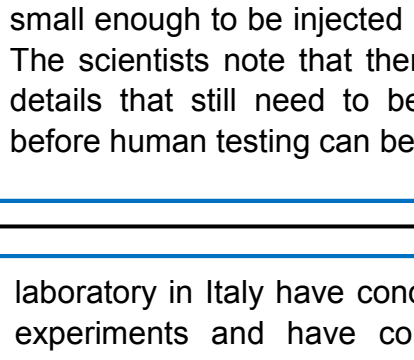
Recently, researchers at the Boston Children's Hospital found a way to overcome this problem. According to Science Magazine, John Kheir and his team created a solution that is partially composed of microparticles that carry oxygen in the body. These particles contain lipids, which are fats, and oxygen. This is injected into the bloodstream allowing the patient to live without breathing for fifteen to twenty minutes. This time is crucial when operating on a patient. Researchers at Boston Children's hospital have tested this substance on rabbits and results were successful.

There have been previous attempts to transport oxygen into the bloodstream of someone who cannot breathe, however, according to Thai Medical News, this can cause gas embolisms. Gas embolisms, according to Medical News Today, are when there are pockets of gas in the bloodstream. This stops blood from flowing through the circulatory system by clogging veins. By using microparticles instead of actual gas, researchers at the Boston Children's hospital were able to overcome this problem and create a revolutionary new product.

Nanotechnology: Devices That Travel Through the Bloodstream

By: Tanya Glushkova

As technology becomes more and more advanced, it also becomes smaller. The goal of manufacturers and engineers is to make devices that are light-weight and easy to transport. But this trend does not only apply to the world of handheld devices. A research team at Stanford under Ada Poon is getting one step closer to creating microscopic medicine. The tiny devices that they engineered could be used to travel through a patient's bloodstream and eventually aid in diagnosing patients, delivering medication and performing surgical procedures. The idea is taken from the 1966 science fiction movie "Fantastic Voyage" where a team of doctors are able to travel through a patient's bloodstream in order to heal him from the inside. The team has been working for four years now to create this device, which in total area, is smaller than a penny. The really cool thing about this machine is that it is powered wirelessly by electromagnetic radio waves as it navigates around the body. The goal is to make the chips biodegradable and small enough to be injected by a needle. The scientists note that there are many details that still need to be addressed before human testing can begin.



Technology in the Body
www.mobilehealthnews.com

New Vaccine to Cure Cancer

By: Tanya Glushkova

There are millions of people diagnosed with cancer each year in the US alone. Scientists in Tel Aviv University have been working in collaboration with Vaxil Bio Therapeutics to create a drug that could potentially fight cancer. The immune system is responsible for protecting the body from diseases like cancer, however many cancers have evolved, and are now able to stop the immune system from fighting back. The new drug called ImMucin works by prompting the immune system to fight the cancer cells. It attacks the cancerous molecule called MUC1 which is found in 90% of cancer patients. ImMucin alerts the immune system of the distinct shape of the cancerous MUC1 and helps kill it.

Vaccine Photograph
www.cienciautil.com

The new vaccine is making headlines for its astonishing results in a trial. Ten patients with a rare form of blood cancer called Multiple Myeloma were treated with this drug. Seven showed signs of a stronger immune system and greater resistance to the cancer, while three were free of the disease. Of course this drug is only in the early stages of testing and it will be a while before it can be used in hospitals. However scientists are hopeful that the drug will be available to the general public beginning 2020.

The Fastest thing in the Universe

By: Nikhil Shah

Albert Einstein
www..popfi.com

Update: This article was posted in the last issue of this newsletter. Recent findings have revealed that neutrinos are not faster than the speed of light. There was a mistake in the data. According to the Science Magazine, there was a loose fiber optics cable that connected to the GPS receiver. This loose cable made it seem like neutrinos were able to travel from the two centers 60 nanoseconds faster than light.

If you ask someone what the fastest thing in the universe is, you'll probably get the answer "light". For a long time, physicists accepted this as the answer. Recently, however, this fact has come into question. Scientists at CERN in Geneva, and the Gran Sasso laboratory in Italy have conducted some experiments and have come up with some very interesting results. They have observed that neutrinos, small, subatomic particles with no charge and virtually no mass, are travelling faster than the speed of light! If the data from this experiment is widely accepted as fact, then this information will cause drastic changes on modern physics and Einstein's theory of relativity

This data came from a standard experiment conducted between the CERN scientists and scientists at Italy's Gran Sasso laboratory. Neutrinos were sent from the CERN laboratory to the Gran Sasso laboratory to see how frequently the neutrinos change "flavors". The "flavors" refer to the different type of neutrinos. In this case, the neutrinos were being sent from CERN as a flavor called muon neutrinos, yet some were received as another flavor, called tau. When the neutrinos reached Gran Sasso, the scientists noticed something interesting. The neutrinos arrived at the laboratory a . Now, 15,000 trials later, the scientists have reported that this has happened so many times that the only reason that this has not become accepted as a fact is because it would contradict one of the most widely accepted rules of physics, which is that the speed of light is the fastest thing in the universe.

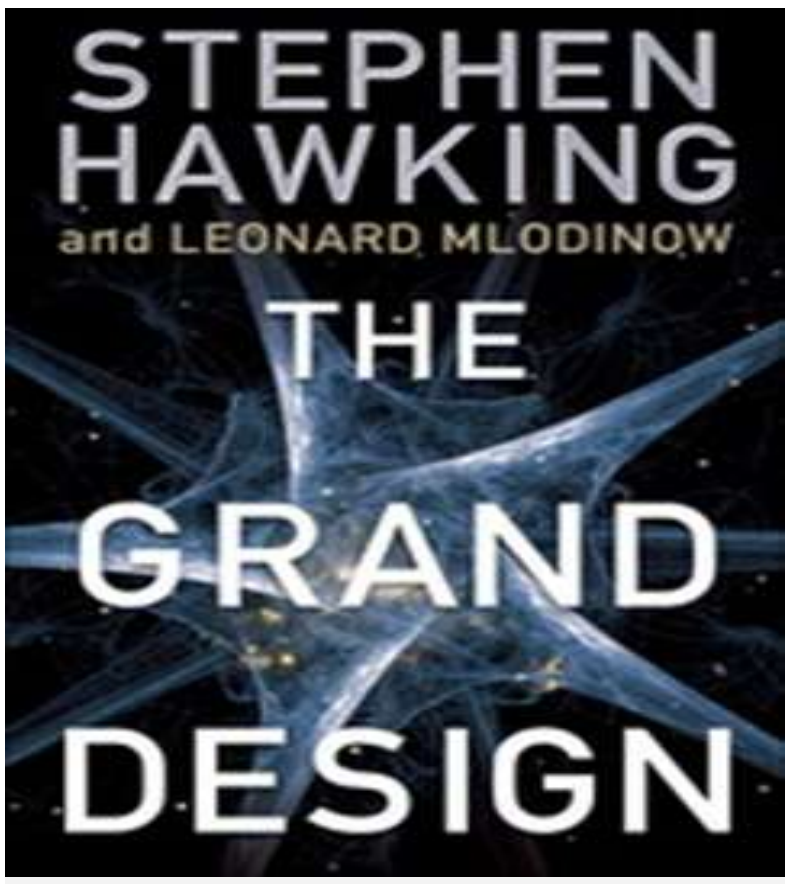
Book Review...

Stephen Hawking and Leonard Miodinow — The Grand Design
Rating: 5/5
By: Tanya Glushkova

The Grand Design is one of the well-known works of Stephen Hawking in collaboration with Leonard Mlodinow. This book attempts to answer the questions regarding our existence in the universe. They begin the book, by posing three questions:

- Why is there something instead of nothing?
- Why do we exist?
- Why does this particular set of laws govern our universe and not some other set?

The authors attempt to answer these deep questions through a series of eight short chapters detailing the proposed and accepted theories about the universe throughout history.



The Grand Design's Cover

The first couple of chapters go into the origins of science itself. They tell the story of the legends that came before the study of any science existed. They explain key theories that were proposed from the time of the ancient philosophers to the study of astronomy and Galileo. Several chapters into the book, the authors discuss the complex world of quantum mechanics, and how it relates to Einstein's relativity theories. Hawking and Mlodinow culminate their discussion with "M-Theory", which is ultimately "the theory of everything", and claim that it is "the grand design" of the universe. As a final note, the three questions asked in the first chapter are answered.

This book manages to describe complex scientific concepts using simple, non-technical terms. The hints of humor and detailed pictures make it a fun book that anyone can enjoy. It is best described as the discussion of "the territory where scientists, philosophers, and theologians meet-if only to disagree."

Evaluation Report for our Roboclub parents and students

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Currently, we are working towards the possibility of a robotics pin/badge recognition system. We hope this will serve as an inspirational tool for students at Storming Robots. More details at: http://www.stormingrobots.com —-> Our Programs —> RoboClub —-> Student Evaluation Report.

Book: C Programming A Modern Approach
Author: K. N. King
Rating: 5/5
By: Nikhil Shah

Programming can be a fun, practical and rewarding task. It has a multitude of applications in the professional world and computer scientists have very strong and promising careers.

Hence, it would make sense that learning a language which helps us not only to understand the fundamental programming structure, but building a sound core foundation in understanding how a language interfaced with computers. Choosing to learn C programming language will be a good avenue.

C programming language, while some may consider to be old style, or too difficult to learn, is not only ubiquitous in lower level system development, but also a higher level programming language closest to the assembler/machine level.

I would like to recommend the C Programming: A Modern Approach, by K.N. King. It allows its readers to understand the basics of programming structure. Each chapter takes an easy to understand format, but also challenging topics for reinforcing understanding.

This book starts by teaching the basics, such as simple standard input/output interface, loop structures. It then goes deep into data array, pointers manipulation, bitwise operations, file I/O and abstract data type, and many others.

Every chapter starts with an explanation of a topic and then breaks down that topic into smaller subtopics. Most of programming projects not only guides you to learn programming syntax, warnings in common semantics errors, but also reinforces understanding. Thankfully, there are excellent examples for virtually every concept taught in this book that allow the reader to actually see how each concepts work.

At the end of each chapter, there is a Q&A section that answers common misconceptions. It also helps readers avoid "silly mistakes" when programming to make sure they understand the syntax in a very detailed manner.

Finally, each chapter is concluded with a section of programming projects and exercises. These problem sets start out being simple enough to allow readers to apply newly learned concepts. Then it is followed by more complex problems set which requires readers to think outside the box and knowledge application. This is the most important thing for the readers to have; as this involves creating algorithms instead of ad-hoc. They encourage more elegant / efficient solutions, and more complex programs that are more likely to be needed in the professional world.

Storming Robots Leaves Mark at International Level Competitions

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Team Zulu's First Place Super Team Championship Trophy

The World Championship competition is divided into Major and Junior Leagues. The RoboCupJunior league events in which student teams design, construct, and program autonomous robots to perform a variety of challenges, including soccer, rescue, and dance.

In the RoboDance competition, the Storming Robots' Team Zulu won the Super Team World Championship, along with teams from Mexico and Germany!

Team Zulu is composed of Colleen McConnell (age 11) of Skillman, Sanjana Sastry (age 11) of Edison, and Brenna Herrity (age 13) of Yardville. Colleen McConnell explained, "Language was our biggest struggle.… We had to use GoogleTranslate. We worked throughout the four days there from day to night. In the end, we all had a great time and benefited from the experience. "

Continue below…

Teams gathering at the Event Party. (From left to right) Ashley Yang, Sergei Zakharin, William Cui, Michael Xie, Luke Dai, and Sunny Aggarwal.

Team Zulu—work in progress.
(from left to right) Colleen McConnell, Sanjana Sastry, Brenna Herrity

Continue from above…

In the RoboSoccer match, teams of autonomous robots played two-on-two in a highly dynamic environment, tracking an infrared emitting ball in an enclosed field.

For the soccer match, the Storming Robots were represented by "The Dimensions" who won the Third place in the World Championship! The team composed of Luke Dai (age 13), the captain, of Belle Meade, Vadym Glushkov (age 13) of Belle Meade, and Sunny Agarwal (age 14) of Bridgewater.

Team Dimension's Third Place Trophy

Team Dimensions.
(left to right): Luke Dai (captain), Vadym Glushkov, Sunny Aggarwal

The RoboRescue competition is divided into two events: Rescue A and Rescue B. Storming Robots entered teams for both events: SR-chitect for Rescue B and the Cheezpuffz for Rescue A.

The RoboRescue competition simulates a disaster scenario in which team members must identify victims quickly.

Team SR-chitect / Rescue B.
Andre Gou, Michael Xie, Eric Ward

In Rescue B, SR-chitect had to seek out victims simulated by heating elements scattered throughout a maze with non-predetermined floating-walls and numerous obstacles in their robot's path. This game is only for secondary level due to it complexity. SR-chitect made up of Michael Xie (age 13) of Warrensville and Andre Gou (age 14) of Watchung, finished tenth out of twenty teams.

Team CheezPuffz./ Rescue A
(from left to right) Ashley Yang, Sergei Zakharin, and William Cui

In Rescue A, field with victims can be found in the form of tin cans. The robots have to display human activity by sweeping through the fields in order to locate all victims. Lastly, the robots must find their ways back out to the entrance to indicate that the robots' missions accomplished -the victims have been brought back to safety. The CheezPuffz, made up of Ashley Yang (age 13) of Basking Ridge, Sergei Zakharin (age 14) of Basking Ridge and William Cui (age 13) also of Basking

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Headline News...

Storming Robots Leaves Mark at International Level Competitions

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Ridge, ranked twentieth out of thirty two teams.

I, even as their mentor, did not go to the event with the teams for her commitment to coordinate SR's summer workshops, as well as volunteer to mentor a project team in the NJ Governor School of Engineering. I proudly told concerning parents, "These roboclub students have been trained to be independent and self-driven thinker, and more importantly, he truly knows their stuff!"

Michael Xie's mother said, "I'm so proud of Michael for his persistency in continuing improving throughout the games, and ability to figure out such intricate problems even when it seemed to be impossible to others."

William's mother added, "I am so proud to watch Ashley, William, and Sergei…they continuously worked as a team, discussed, and came up with actions and execution."

RobocupJunior is very different from all the other robotics events held in the United States. The World Tournament of RCJ takes place in conjunction with RoboCup, which is attended by hundreds of research scientists and engineers from all around the world. The opportunity to interface with researchers and to watch their amazing robotics apparatuses in action truly sparks inspiration and interest in engineering among these children.

The RoboClub members have shown impressive dedication and resourcefulness as they systematically planned, analyzed, and troubleshot their robot's programming to ensure consistency. Preparing for this competition has been an incredible learning opportunity.

William Cui waiting for his turn to write his name on the giant poster filled with signatures of competition participants from 30+ countries.

Storming Robots Leaves Mark at International Level Competitions

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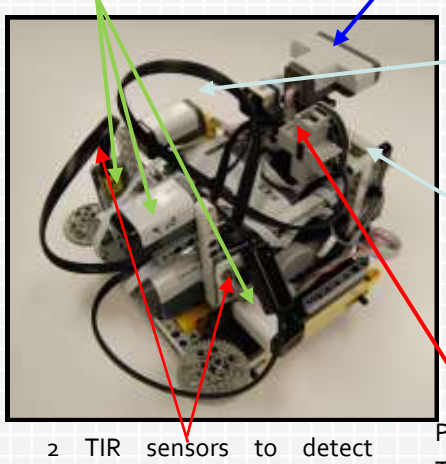
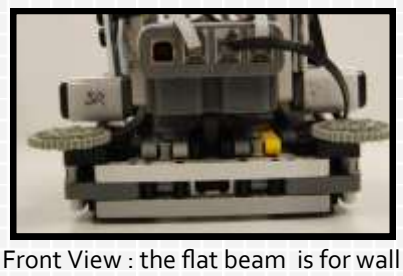
Highlight of their robots

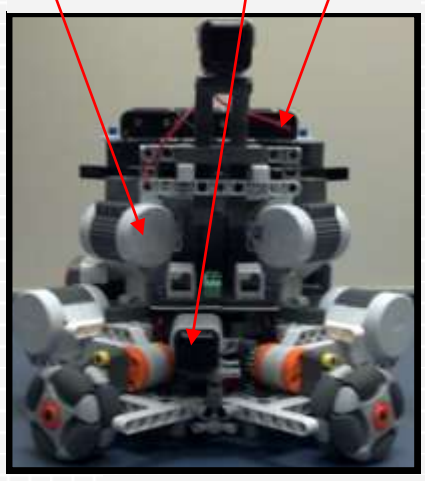
Rescue B / Team SR-chitect / Maze with Floating Walls

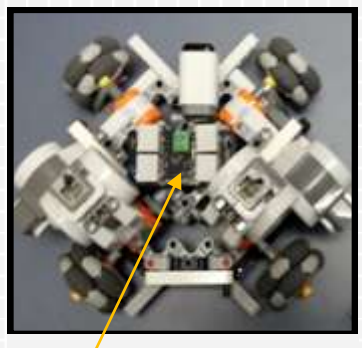




Front View : the flat beam is for wall alignment . The rollers on the side is to minimize jamming against walls.

Soccer / Team Dimensions / 2-on-2 Game

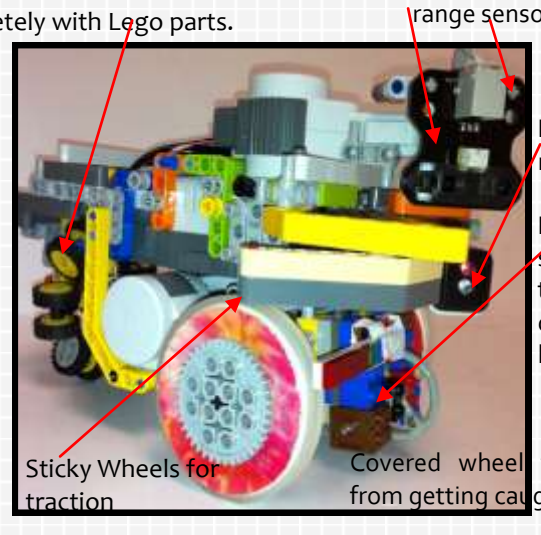




Top View: with a port splitter. (no controller).

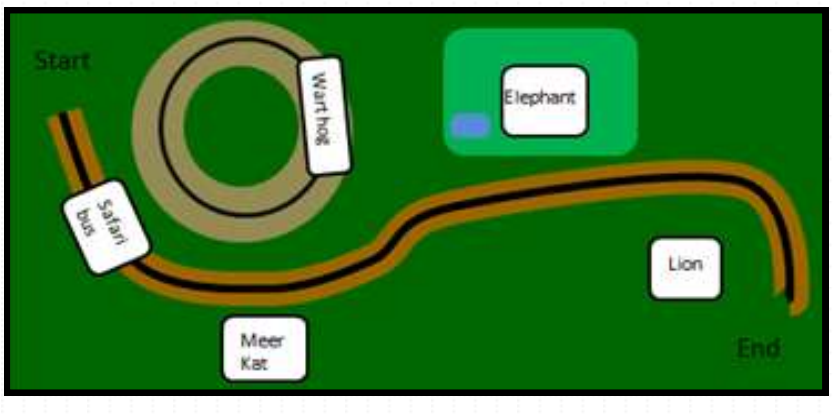
Back View : with the controller and two ultrasonic sensors for wall detection.

Rescue A / Team CheezPuffz



RoboDance / Team Zulu

The game is very dynamic. Team needs to not only build and program their robots, but also design its own presentation field. They have five robots featuring as "Elephant", "Warthog", "Lion", "Meer Kat", and a "Safari Bus". Here is a picture of the field layout.



Team Zulu's Meer Kat

The Meer Kat's design was inspired by the surprising way that Meer Kats pop out of their hole unexpectedly.

Clever (functional, simple, and inexpensive at the same time) mechanism for converting rotational to linear motions allowing the Meer Kat to pop its head up and down.

Won The 2012 USA MIT/NASA — ZeroRobotics Satellites Automation Tournament

Continue from page 1...

"... Take robotics competition to new heights, literally - running miniature satellites (the robot) aboard the International Space Station! ..."

The competition had nine alliance teams from across the United States and three alliance teams from Europe. Each alliance team was made up of three teams that had made it to the finals in December of 2011. However, the actual game was rescheduled to late January of 2012 in order to wait for availability of ISS.

NASA awarded two winners: one from United States and one from Europe.

Storming Robots formed an alliance team with students from the River Hill High School in Maryland and the Rockledge High School in Florida.

Photo from each individual student
Team Picture: (from left) Avery Katko, Matthew Goldman, Matthew Sicotte, Nikhil Shah; Ben Brown.

Our work posted the best cumulative score among three round-robin eliminations and one final round. All participants watched as their program ran on the satellites with astronauts Don Petit and Andre Kuipers aboard the ISS acting as referees.

NASA Administrator Charles Bolden said, "It is just amazing to me what these high school students have accomplished. To program a robotic spacecraft with the precision of a NASA flight controller is quite a feat, but to have that ability, talent and discipline at such a young age is remarkable."

A quote from the MIT's ZeroRobotics' site – "… it is a student competition that takes "arena robotics"

SPHERE Flight Patch" which flew in the official flight kit aboard the Space Shuttle Discovery on September 22nd 2006.

Continue below...

Won The 2012 USA MIT/NASA — ZeroRobotics Satellites Automation Tournament

Continue from above...

Courtesy from the Space System Laboratory/ssl.mit.edu

to new heights, literally. The robots are miniature satellites called SPHERES and the final competition of every tournament is aboard the International Space Station!"

This competition is an intensive engineering /physics /programming centric program where the teams design software to automate small satellites aboard the International Space Station. The goal is to build the culture of pushing the limit of engineering and space exploration.

The competition schedule was very intensive. Programs were required to be submitted twice in October of 2011 to run in simulated competitions. It was then followed by an elimination round in early November.

There were a total of over 190 teams from all over the U.S. The top fifty-four teams advanced to the Semi-Final Round where they formed into alliance teams, made up of three teams each.

In the last three weeks of November, the teams diligently engaged in productive discussion for more math, coding and strategy enhancement using Storming Robots' internal online forum as the main media for communication. On December 2nd, the alliance team submitted code for another elimination round. The top nine alliance teams were selected to enter the ISS Finals including Storming Robots team.

The Storming Robots team consists of five members: Avery Katko, 17; Matthew Goldman, 17, Bernardsville High School; Matthew Sicotte, 16, Somerville HS; Ben Brown, 17, Gills Saint Bernard High School; and Nikhil Shah, 16, Ridge High School. Many of these students have been attending Storming Robots for more than four years. Avery and Matthew have been with Storming Robots since 2005.

Storming Robots, along with the two other alliance team , received this poster and the flight patch.

They all worked at a very high level of motivation, and took responsibility for their own work. They demonstrated to be THINKERS and inventors. They worked hard and loved doing it.

In April of 2012, Storming Robots received a "SPHERE Flight Patch" which flew in the official flight kit aboard the Space Shuttle Discovery, 12A, 1/STS-116 on September 22nd, 2006. It was given to Storming Robots from the Massachusetts Institution of Technology, and NASA.

This Flight Patch is for the Synchronized Position Hold, Engage, Reorient Experimental Satellites (SPHERE) Mission. They were handed over to the US DOD Space Test Program at the NASA Johnson Space Center on February 6th, 2007 by the NASA Increment 14 Payload Manager on behalf of the International Space Station Payloads Office.

Each team member was also given the same patch as a souvenir.

Data Streaming with GPS and Robotics

By: Nikhil Shah, Elizabeth Mabrey

Throughout the Spring and Summer of 2012, I have worked on a project involving GPS, so I thought it would be a good idea to discuss an approach to stream positioning data via a GPS signal receiving device from Satellites. For this project specifically, I used a Qstarz GPS Receiver shown here.

www.pocketgpsworld.com

The purpose of this algorithm is to take a GPS data string and to use it to figure out one's distance from another point on Earth given its latitude and longitude.

My first phase of the project is to have my robot automatically route itself to a pre-defined known location.

To complete the communication route requires a sequence of subtasks. What is the best way to do this than illustrating them in steps! Here they are:

1. Establish a Bluetooth (BT) connection between the GPS receiver and our controller NXT programmable brick.
2. Search the proper GPS BT device.
3. Create a connection channel to the GPS receiver.
4. Starts reading the data stream from the satellite via the GPS receiver. The data stream is called the GPS Sentence. My project only recognizes the Global Positioning System Fix Data Sentence type ($GPGGA). Refer to Figure 1 below.
5. Extracts only the relevant information from the GPS sentence. For this example, the string would have 75 characters. The only relevant information will include cardinal direction, the number of satellites used to acquire the data to ensure minimal accuracy. The most important data required are Latitude and Longitude.
6. Isolate these pieces of information with some intrinsic RobotC functions. These functions can copy and delete selected portions of a string. Eventually, I was able to isolate only the latitude and longitude.
7. Converted the Latitude and Longitude into the integer and floating point forms. This makes them computable in RobotC. To convert them, the function "atoi" which converts "alpha-numeric to integer, or you will simply do a simple math, such as for character '9' , do '9' - '0'; this will give you integer 9; as integer 9 is not character '9' in computer. This will make the latitude and longitude computable. The structure of the latitude and longitude that I had was DDMM.MMMM. The "D" represents GPS degrees, and the "M", represents minutes. Since I am not traveling a large distance, the degrees of my location are not necessary.
8. Normalize the MM.MMMM to actual meters based on the **Universal Transverse Mercator** (**UTM**) conversion. Refer to Figure 2 and 3 below.

   We call these as UTM coordinates. At this point, the two points are represented in meters UTM Coordinates.

   Figure 4 below demonstrates an example of converting the GPS Lat/ Lon TO UTM in meters. Notice that the conversion units changes for the Longitude. Meters/sec decreases as meridians converge at the poles, while it increases approaching the equator. At the equator, the measurement is similar to Latitude's.

Continue below...

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To convert, the minutes must be converted into seconds first. This is done by multiplying the minutes by 60. The seconds will then be b multiplied by the proper conversion unit (based on its location on the globe) to arrive at meters. You will then be able to take the difference in meters between my robot and the target point, horizontally and vertically.

10. Triangulate my robot's current point to the pre-determined target.

a) Find the distance between the two points, I make the longitude and latitude UTM coordinates as the two points forming the two legs of a triangle, the distance between the two points can be calculated using the Pythagorean Theorem.

b) The angle between the hypotenuse and "longitude leg" must be calculated by applying either inverse sine or inverse cosine.

11. Turn the robot's heading to the target location by using the compass, and the calculated angles.

12. Step 4 to 11 will be repeated periodically to ensure accurate routing toward the destination.

The next phase of the project will enable the robot automatically detect a mobile target. I may incorporate the theme of a BatmanBot chasing after a JokerBot. Moving target will make the task much more challenging and fun.

Figure 1. Sample $GPGGA Sentence.

$GPGGA	Data type of this sentence.
hhmmss.sss	UTC (Coordinated Universal Time) of position
llll.llll	latitude of position expressed in DDMM.MMMM
a	N or S
yyyyy.yyyy	Longitude of position expressed in DDDMM.MMMM
a	E or W
x	GPS Quality indicator o to 8, with o=no fix
xx	number of satellites in use
x.x	horizontal dilution of precision
x.x	Antenna altitude above mean-sea-level
M	units of antenna altitude, meters
x.x	Location Geoidal separation (above sea level)
M	units of geoidal separation, meters
x.x	Age of Differential GPS data (seconds)
xxxx	Differential reference station ID

Use only the "red" data below from the sentence)

Figure 2: Map showing the entire UTM grid system and the relative location of each UTM zone.
From Penn State university— (Dana 1995) ©1999 Peter H. Dana.

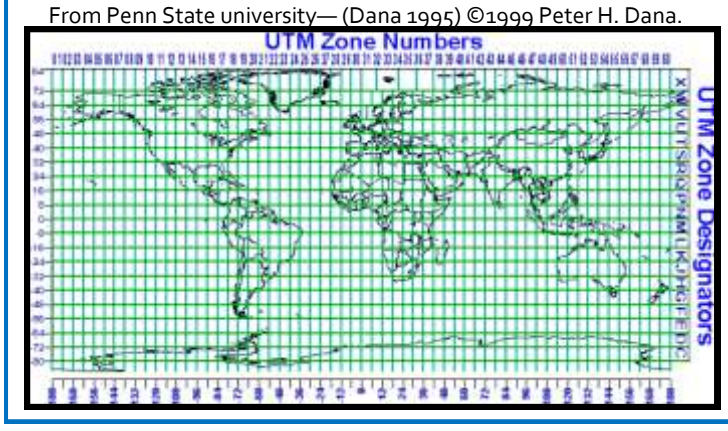


Figure 3: The ***Universal Transverse Mercator*** grid that covers the conterminous 48 states

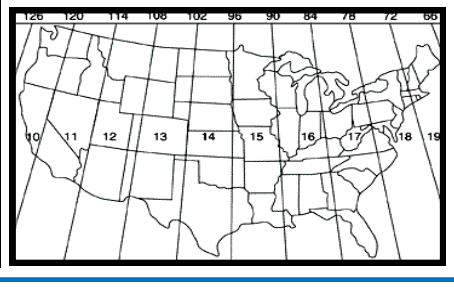


Figure 4: Example of Latitude and Longitude data presentation and it's normalized value.

Latitude: Equally spaced.
1 sec = 0.01917 miles = 30.85 meters
UTM = ((Deg*60+Min)*60 + Sec) *30.85

Longitude: Meters/sec ⇩as meridians converge at the poles.
Meters/sec ⇧ approaching the equator
At the equator, the measurement is similar to Latitude's.
1 sec ~= 23.35 meters (at Central NJ)
UTM = ((Deg*60+Min)*60 + Sec) *23.35

e.g. Location of Storming Robots:
40°36'28.25"N 74°42'4.86"W
UTM = 4509177N 5521027W

Sets of Anagrams

By: Tanya Glushova and Elizabeth Mabrey

This program identifies sets of anagram from a set of given words. For example, say the words entered included: “cat”, “act”, “mac”, “bat”. The program would output “3” as the number of sets of anagrams. “cat, act” make up one set. “mac, cam” and “Apple” are two other separate sets. This program can be completed with the use of two arrays and some functions.

To help clarifying the algorithm, best way is to list the steps:

1. Start with a character 2D-array called, e.g., words[N][M], where N is just an arbitrary value that can be changed later and M means the maximum size of each word. It is possible to allow the user to enter the words into the array, or even using dynamic memory allocation of un-predetermined number of words. However, for simplifying debugging process and focusing on proof of concepts, I simply hardcoded the list of words for testing.
2. Create another character array called, e.g., temp[N][26]. 26 is representative of all the possible alphabetic letters that the word could have. Add the number of occurrence of each letter in the first word, “cat”, into the first row of table temp, i.e temp[0].

For example: cat

Add the # of occurrence of each letter of the word into temp[0][...]:

a	b	c	d		t		z
0	1	2	3	...	19	...	25
1	0	1	0	...	1	...	0

3. Add the number of occurrence of each letter in the second word, “act”, into the temp[1].
4. Based on the previous example, “cat” and “act” are anagrams, so when temp [0] and temp[1] are compared, they turn out to be exactly the same. In this case, we use the memset() function to reset the second row to zero (like it was before we inputted the second word).
5. Add the occurrence of all the letters in the third word, “mac” from words[ ][ ] to the temp[1] again. The temp[1] is compared with the temp[0]. In this case when “cat” and “mac” are compared, they do not contain the same number of occurrence of letters, and therefore are not anagrams of each other. “mac” remains in the temp[1] array.

For example: mac

Add the # of occurrence of each letter of the word:

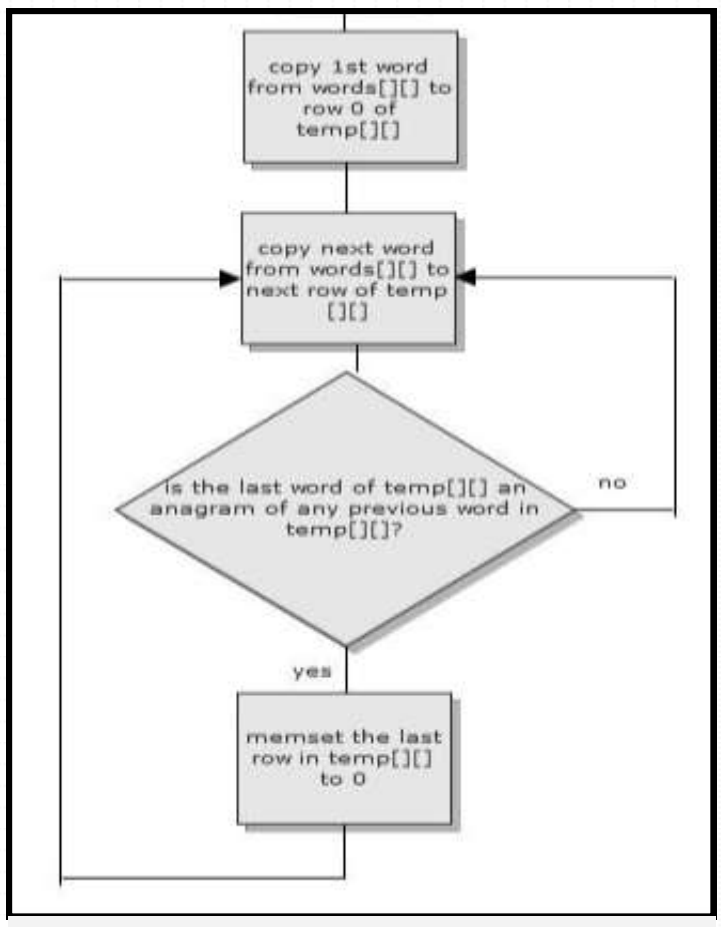
a	b	c	d	...	m		t	...
0	1	2	3	...	12	...	19	25
1	0	1	0	...	0	...	1	0
1	0	1	0	...	1	...	0	0

6. Add the occurrence of the letters in the fourth word, e.g. “act”. Into temp[2]. It is then tested against the temp[0], which contains the letters occurrence from “cat”. Since it has the number of occurrence, stop and go to the next word.
6. Take the next word, e.g., “bat”. Again, add the number of occurrence of each letter in this word into Temp[2]. Since it is different from Temp[0] (which represents “cat”), it then tested against the temp[1] (which represents “mac”). Since it is different from the existing ones, it remains in the temp[2], and becomes the third set of anagram.

Continue below...

Continue from above ...

7. The process continues until all words in the words[ ][ ] are consumed.



Flowchart to give an overview of the algorithm design.

8. The number of sets of anagrams is the number of total rows in the temp array. In this example, it is three.

After the proof of concepts, I then run this with as many set of phases or words if you wish and generate correct result within a short time. If you think you have a more efficient algorithm to figure the total number set of anagrams, please write to us at loosegears@stormingrobots.com .

Take the words list : “cat”, “act”, “mac”, “bat”.

For the 1st word “cat”, add in the temp[0]

1	0	1	0	…	1	…	0

For the 2nd word “act”, add in the temp[1]

1	0	1	0	…	1	…	0
1	0	1	0	…	1	…	0

Compare and remove as sit is the same.

1	0	1	0	…	1	…	0
0	**0**	**0**	**0**	**…**	**0**	**…**	**0**

For the 3rd word “mac”, add in the temp[1]

1	0	1	0	…	0	**…**	1	…	0
1	0	1	0	…	1	…	0	…	0

Compare and remains as it is different.

1	0	1	0	…	0	**…**	1	…	0
1	0	1	0	…	1	**…**	0	…	0

For the 4th word “bat”, add in the temp[2]

1	0	1	0	…	0	**…**	1	…	0
1	0	1	0	…	1	**…**	0	…	0
1	1	0	0	…	0	…	1	…	0

Compare and remains as it is different.

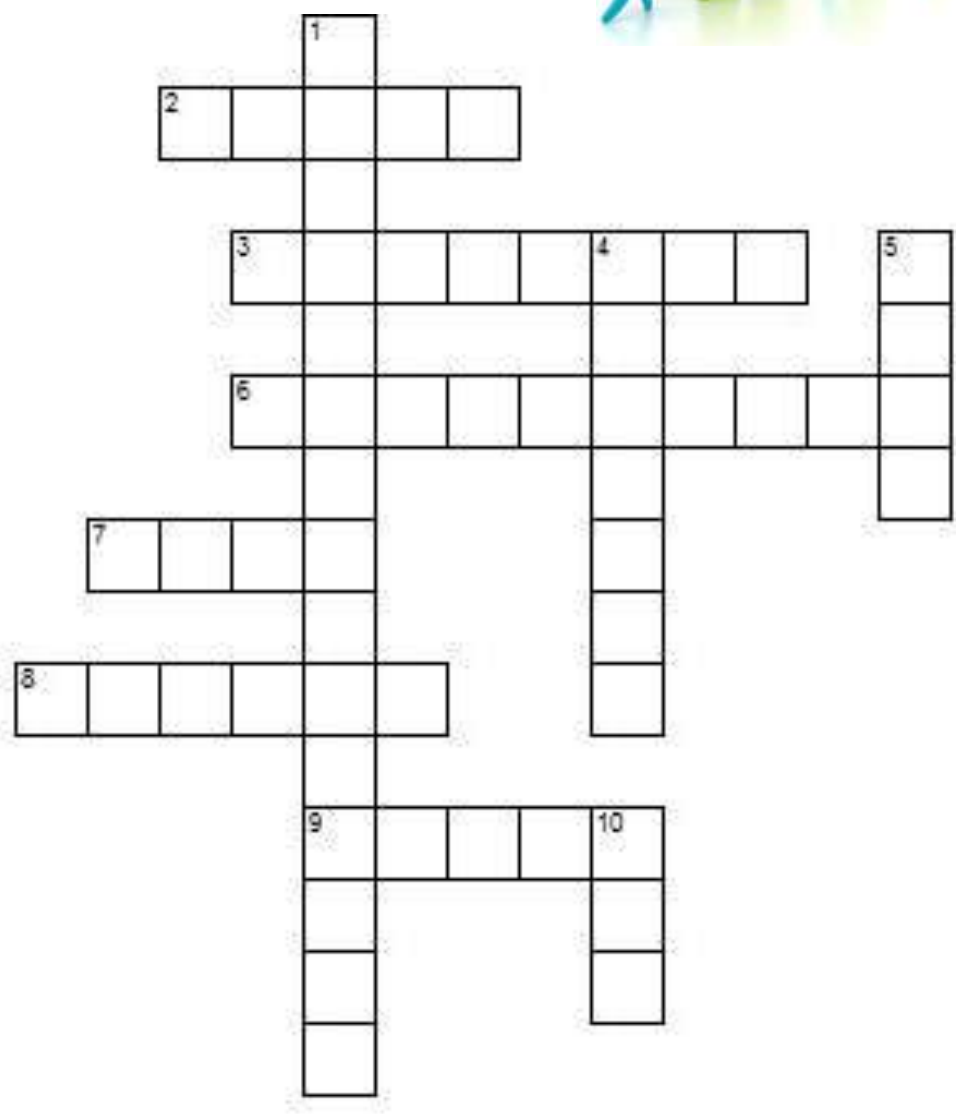
1	0	1	0	…	0	**…**	1	…	0
1	0	1	0	…	1	**…**	0	…	0
1	1	0	0	…	0	**…**	1	…	0

There are 3 rows left. That means there are 3 sets anagrams.

The Lighter Side ...

Crossword—

Renewable Energy Trivia



Across

2- Geothermal resources include reservoirs of this _____.

3- _____ are the type of equipment used for heating and cooling a house with geothermal resources.

6- A clean burning fossil fuel.

7- This fossil fuel is currently the main source of electricity product on earth.

8- Often found in National Parks. this type of hot spring serves as a useful source of geothermal energy.

9- Geothermal energy is energy that comes from the _____.

Down

1- A geothermal heat pump is an example of this type of technology.

4- Radioactive material used in nuclear energy.

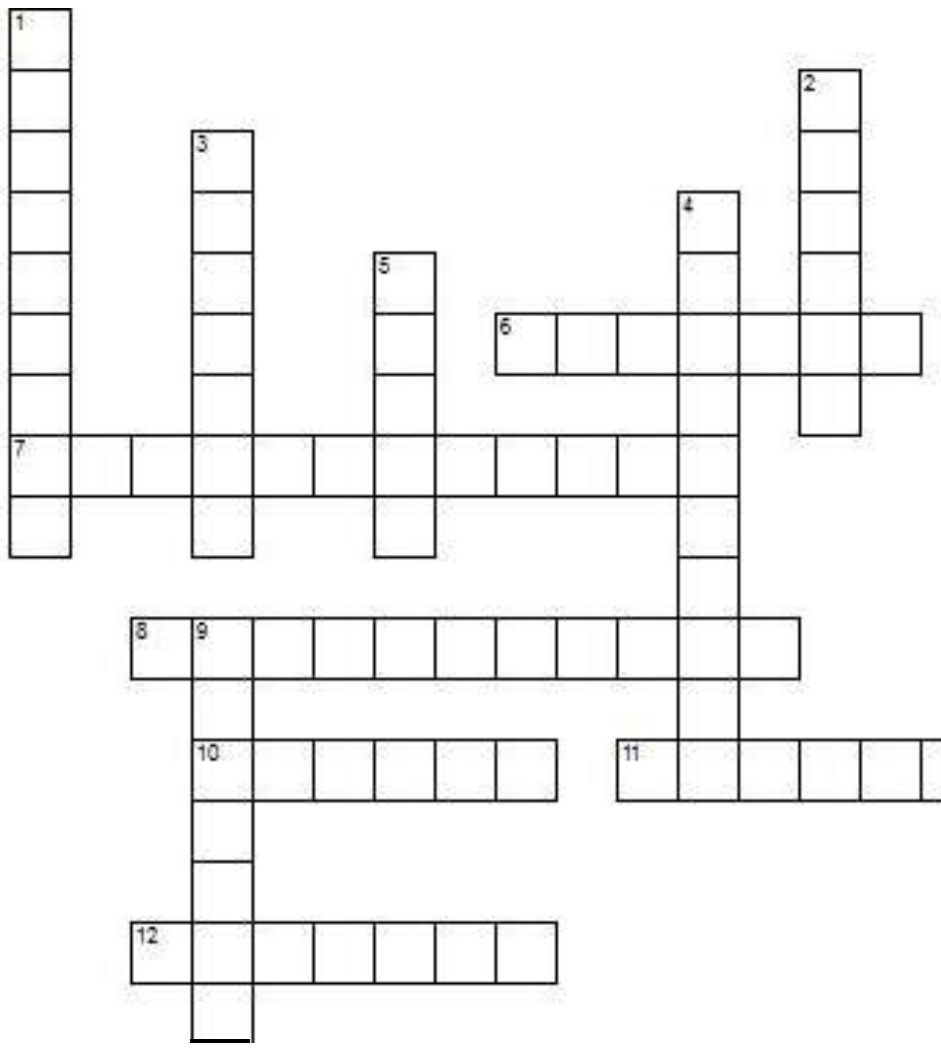
5- A region in the United States where geothermal technology might be seen.

10- In summer months, geothermal heat pumps help remove this type of air from indoors to outdoors.

Answer Keys for the Cross

Earth Steam RenewableEnergy HeatPump West
Geyser Coal Natural Gas Uranium Hot

Robotics Trivia



Across

6- _____ recognition means identifying reoccurring patterns in input data with the goal of understanding or categorizing that input.

7- Process of finding the best values for the independent variables within a function, which is most commonly the maximum or minimum value.

8- Any object attached to the robot flange (wrist) that serves a function.

10- _____ Test is a way to test machine intelligence

11- 3 Laws of Robots are created by_____ .

12- _____ Learning means the artificial intelligence techniques that make it possible for machine performance to improve based on feedback from past performance.

Down

1- A method of solving a problem by repeating the same procedure to find a more exact solution.

2- _____ systems means Information systems or software programs designed to replicate the decision-making process of a human expert.

3- The parts making up a machine not including the body or casing.

4- Operating without pre-programmed behaviors and without supervision from humans.

5- _____ Logic means the type of logic that allows conclusions to be stated as probabilities rather than certainties .

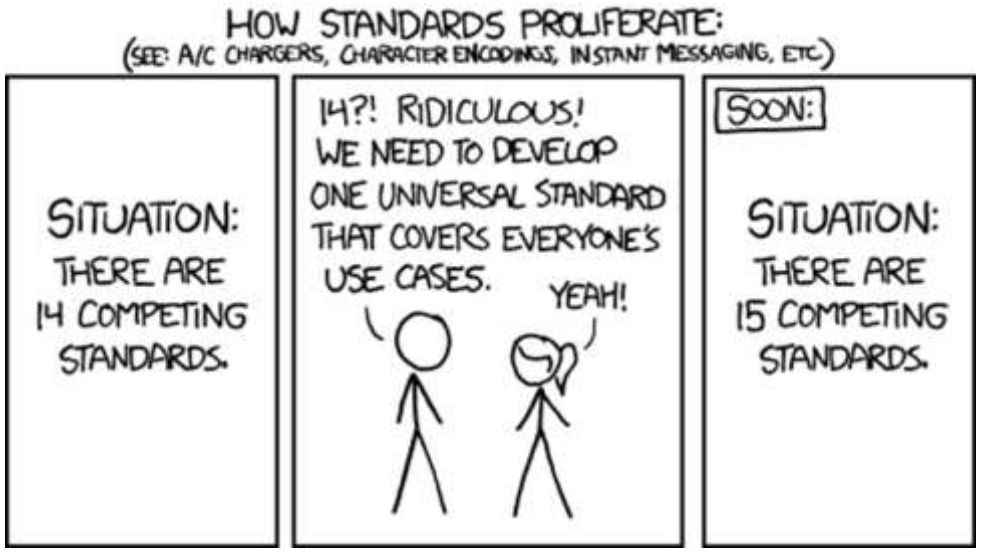
9- _____ Language is the language that people speak and write everyday.

Answer Keys for the Crossword puzzle:

End-effector Fuzzy Iteration Machine Asimov Autonomous Optimization Chassis Pattern Expert Turing Turing Natural

Robot Comic...

Have A Laugh with Robot Comics!



Credit: xkcd.com/927/

By: Bhavik Shah

Storming Robots

Special Notes

If classes need to be cancelled due to inclement weather, notification will be posted right on the main page of our website: http://www.stormingrobots.com

Center Calendar: http://cal.stormingrobots.com

Roboclub information: summer.stormingrobots.com

Twitter: www.twitter.com/stormingrobots

Home Site:	http://www.stormingrobots.com
	If classes need to be cancelled due to inclement weather, notification will be posted right on the home site.
Center Calendar	http://cal.stormingrobots.com
Summer programs:	http://summer.stormingrobots.com
Twitter:	http://www.twitter.com/stormingrobots
Current competition:	2012 MIT/NASA ZeroRobotics .
Nov 1st:	Start to accept articles for 2013 Newspaper Issue V.
Nov 8th:	Special Workshop on the NJEA School Day off
Nov 20-25th:	Thanksgiving Holiday. Center Closed.
Nov 28th:	Renewal for 2013 Winter Term starts.
Dec 16th:	Last Day of 2012 Fall Term of Roboclub
Dec 24-31st:	Center closed.
Jan 4th:	2013 Winter Term starts. (End on March 17th.)
Feb. 13-17th	Spring Break. Center Closed.
Mar. 20th	2013 Spring Term starts. (End on May 26th.)
April	RobocupJunior Tournament. Date pending.
April 15th:	Articles due for the 2013 Newspaper issue V.

Call for Interests

¨ Looking for Columnists! Please contact us if you are interested!

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