Fall 2012

THE SYNERGIZER

ENGINEERING AND COMPUTER SCIENCE NEWSLETTER

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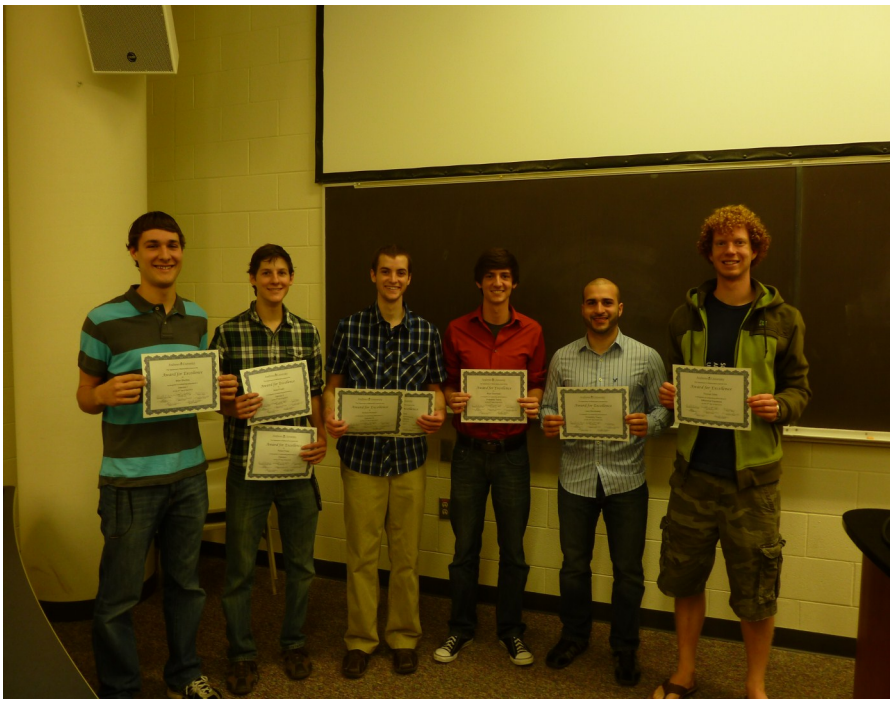
MISSION STATEMENT

The Engineering and Computer Science Department aspires to be a place of choice for engineering and computer science education where dedicated students and faculty grow together to reach their God-given potential for service to society and the church.

Inside this issue:

Math

Six Engineering Students received the Math Award for Spring 2012.



Left to right: Brian Shockey (Calculus I), Robert Polski (Calculus I and II), Andrew Roderick (Calculus III and Differential Equations), Bryan Bankhead (Probability Theory), Larry Mendizabal (Probability Theory), Thomas Zirkle (Differential Equations)

Andrews Computing Program is now ABET Accredited

By Keri Suarez

The Andrews University Department of Engineering & Computer Science's computing program is now accredited through the Computing Accreditation Commission of ABET (Accreditation Board for Engineering and Technology). The computing program offers a Bachelor of Science in Computing with emphases in computer science and software systems.

The engineering program has been ABET accredited by the Engineering Accreditation Commission of ABET since 2006.

"The Department of Engineering & Computer Science is a family and through a team effort, including the support of Verlyn Benson, immediate past dean of the College of Technology, and Keith Mattingly, dean of the College of Arts & Sciences, cont. on pg. 5.

Senior Project: LED Data Transmission

By Mark Joslin

"The group hopes to build an instructive model, as a starting point for further research and testing."

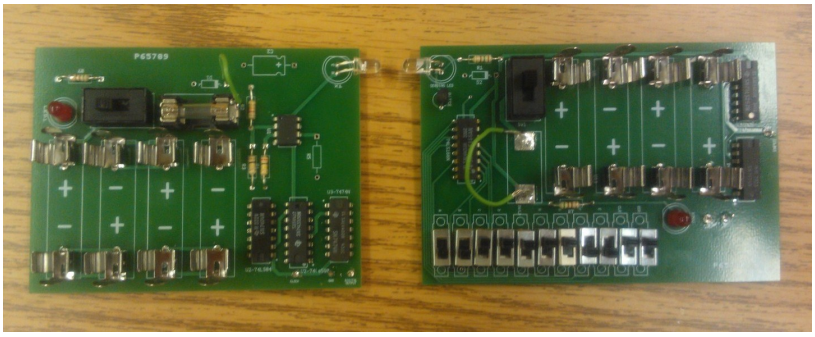
Mary Cregan, Joseph Fluence, and Maverick Maguad are nearing completion of their senior design project. They are working to develop circuit boards that will affect the future of LED streaming technology.

Working as a group these engineering majors are attempting to create circuit boards to be used as instructional models in a technological area which has large, unutilized potential. Essentially, the circuit boards, through a CODEC chip, will receive an audio signal and convert the signal into a numerical sequence of 1's and 0's. This numerical sequence will then be translated, via logic chips, into a blinking LED pattern. A second, unconnected circuit board will collect the LED frequencies and convert them back into audio data.

This technology has many practical applications, and other engineers have created a method of streaming the Internet through these LED circuits in an entirely wireless system. "Ultimately," said Cregan, "you could be able to stream Internet access, or any type of data, through lights in your house. You wouldn't need a router or Wi-Fi."

The group hopes to build an instructive model, as a starting point for further research and testing, as resources for teaching in this area are almost non existent. Cregan plans for the project to serve as a type of "demonstration board" where future students can "practice before they make their own."

Cregan, Maguad, and Fluence have been at work on this project for almost a year, having spent most of the Fall 2011 semester in research, before beginning testing this semester. Initially they planned to use the LED circuits as an early warning system to help in preparation for tornados and other dire weather conditions. During the course of their research, however, they chose to direct the project to a smaller scale. Presentation of their project took place on April 25th, as a final assessment for these seniors. A successful project can initiate future research and development into LED circuits leading to more innovative and efficient technology.



Is SWE Right for You?

By Elizabeth Joslin

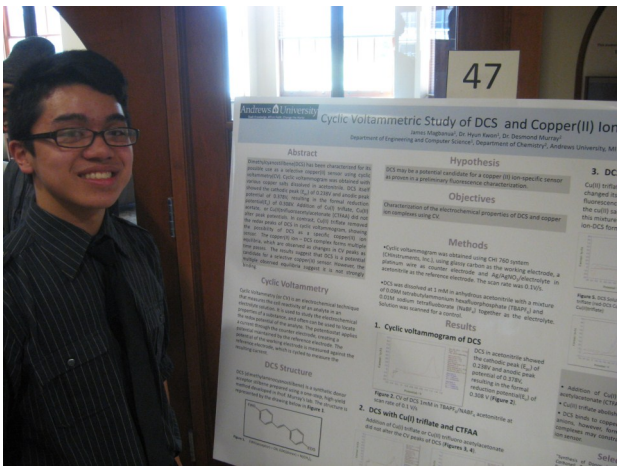
The field of Engineering has searched for a way to engage more women. The Society of Women Engineers (SWE) is an organization which has attempted to attract women to the field of engineering and to inform them of career opportunities. Their goal is to help women engineers to succeed progressively through their programs. Several of SWE's members are invited to attend annual conferences consisting of presentations involving a large range of various engineering topics either technical or relating to becoming an engineer. Other such occasions are career fairs exposing job positions that women in the engineering program might find interesting. Professional development seminars along with other events throughout the year like community service projects provide women with opportunities to develop leadership skills in the work place. In order to attract more women to the field of engineering at Andrews University, Mary Cregan, a senior in the Engineering program, has worked to develop interest in SWE this semester. Cregan has arranged several SWE-sponsored presentations at Andrews University. Cregan hopes that the foundation she is laying will help SWE grow and become a larger part of the engineering department after she graduates.

If you are interested in SWE or would like to become a member, contact Dr. Kwon at: hkwon@andrews.edu.

Two senior SWE members at the National Conference in Chicago: Mary Cregan (left) and Cecilia Dias (right)

Poster Sessions

By Travis King



Current Research: Ray Tracing

By Jeffrey Baker

"The goal of this study is to release an open source that will allow people to experiment with this often used but not readily accessible technology."

Steven Mann (currently studying computing and physics) has been doing research into ray tracing. Ray tracing is a method of rendering 3-D images in far higher quality than the standard method of forming images out of enough small polygons that the human eye cannot detect the difference between the angular surface and a smooth curved one. Ray tracing actually follows the light on the surface of the object back to the light source using various algorithms. This process is often used by companies that deal with 3-D imaging, but usually takes days to render completely. The purpose of this research is to find ways to improve the speed of rendering and if possible, decrease the necessary processing power. This is done by first making sure that all of the equipment being used is operating at maximum efficiency and then trying to improve the algorithms to make the actual processing of information as effective and expeditious as possible. The goal of this study is to release an open source that will allow people to experiment with this often used but not readily accessible technology. Ideally the entire process could be made so efficient that it could be used in the actual gaming process, raising the bar for designers everywhere. It will be interesting to see just how far Steven goes with this research.

"I have always been interested in computers, so a Computing major seemed logical."

Freshman Profile—Alex Hodges

By Nicholas Reichert

Freshman Computing major Alex Hodges came to Andrews University this year for a variety of reasons. Attending high school at Pleasant Hill Adventist Academy in Pleasant Hill, California, Alex wanted to experience another part of the country, so he made the move out East. On top of his desire to experience new places, however, Hodges knew that the Computing program at Andrews was very good, and the scholarship opportunities that he was awarded certainly helped. When asked why he chose Computing as his major, Alex said, "I have always been interested in computers, so a Computing major seemed logical." As a freshman, he has not had the opportunity to take very many classes specific to his field, but says that he has enjoyed taking the Intro to Computer Science class taught by Professor Bill Wolfer. Alex looks forward to taking more classes in Computing as he progresses with his career and plans to become involved in Engineering and Computer Science organizations next year. In the mean time, Alex is putting his knowledge and enthusiasm to good use working for Adventist Information Ministry in the technical department. With a projected graduation date of 2015, Alex looks forward to experiencing all that Andrews has to offer.

Andrews Computing Program is now ABET Accredited

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ABET accreditation of the computing program has affirmed the strength of our program," says George Agoki, chair. "We plan to use the processes of accreditation, which includes assessment, to keep our computing and engineering programs on the cutting edge. ABET accreditation is valuable to Andrews University, but more importantly to our students as they continue their academic or professional journeys."

ABET is the nationally recognized accrediting body for college and university programs in applied science, computing, engineering and technology. ABET is a federation of 31 professional and technical societies that contribute funds and volunteers to set policy, develop strategy and conduct ABET accreditation activities worldwide on behalf of their professions. There are more than 3,100 ABET-accredited programs at over 660 colleges and universities in 23 countries. ABET is recognized by the Council for Higher Education Accreditation.

Advice from a Computing Graduate Student

By Eric "Siggy" Scott

Dear Student,

What are you in college to learn? What will your fancy schmancy shiny degree give you that people who have been in the "real world" since 18 don't already have? More generally, what is the difference between computer science (CS) and computer programming?

You may have found yourself trying to answer this last question over thanksgiving dinner. A quick glance across Googleland will show you a variety of common answers: CS is about building computers while programming is about using them to do cool things; CS is about the inherent mathematical beauty of computability theory, while programming is about everything that actually matters; CS is about researching things nobody knows how to do yet, while programming and software engineering are about applying what is already known. There are as many answers to this question as there are blog posts about it, and most of them are infused with a great deal of elitist (or anti-academic) bias on the part of the author!

So what exactly *are* you getting out of your education? What is the relationship between computer science as an academic field and the real world?

You get out what you put in

Believe it or not, it's not your professor's job to teach you how to be a good programmer. Of all technical areas, computer programming is one of the *easiest* to teach yourself, because of the immediate availability of open-source software and online developer communities. Trust me, you do NOT want to pay twenty thousand dollars a year to be taught how to program -- no more than you would fork over that kind of cash for piano lessons. That's not to say that learning to program, and about the vast

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"Of all technical areas, computer programming is one of the easiest to teach yourself, because of the immediate availability of open-source software and online developer communities."

2012 NSBE Convention

By Micah Mayne

"We loved being a part of something that could potentially improve people's lives."

In Pittsburgh, Pennsylvania, March of 2012, the NSBE (National Society of Black Engineers) convention was in full swing. We arrived at our hotel on Wednesday and freshened up as we prepared for our first National Convention as an official chapter of Andrews University. We boarded the bus once again to enter downtown Pittsburgh, where we passed Heinz Stadium and other large buildings, and crossed into a city themed in the colors of black and yellow. We walked into the Convention Center, quickly registered, and started exploring, looking for which companies would be where and deciding which events we would attend. Within a couple hours of entering we found ourselves speaking with employers from many companies, learning about opportunities and getting one on one experience to prepare for the following day. Thursday, the convention was packed. We stuck together as a group until the doors were opened for us to go from booth to booth, giving résumés and speaking with potential employers. We got feedback from different companies, and in some cases even scored interviews for jobs and internships with major companies. Some four or five hours later we regrouped and traded stories and experiences. Some people returned later than others after getting interviews from Boeing and General Mills. After a long day of interviews, question asking, and sweating, we went out to eat and enjoy the city of Pittsburgh, having what someone would call "a night on the town" Andrews style. Friday, we returned one more time for some last minute interviews and questions. Almost as fast as the convention had started for us, it ended. The experience made those of us who would return the next year want to work harder and be more prepared for the next time, and gave us all insight into how to prepare for our futures as Engineers.

Chicago Trip

By Joann Yin

On April 13, 2012, Dr. Roy Villafane and thirteen engineering students participated in the Chicago Business & Graduate School Trip, which was sponsored by the Society of Women Engineers (SWE), the National Society of Black Engineers (NSBE), and the Society of Hispanic Professional Engineers (SHPE). The purpose of this trip is to help prepare undergraduate engineering students for graduate school and help them gain a better understanding of future careers. Towards this aim, the trip included visits to the University of Illinois at Chicago (UIC) and Burns & McDonnell. The director of UIC's graduate school led a tour of the Department of Mechanical and Electrical laboratories and two Ph.D. students gave an overview of the department. In addition, they provided information how to apply to graduate school. The presentations given by Burns & McDonnell provided some general ideas of the typical engineering working environment, the benefits that the company offers and the variety of job options available in the engineering program.

Advice from a Computing Graduate Student

By Erik "Siggy" Scott

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array of tools accompanying it (SSH, SVN, GCC, Boost, DTrace, design patterns, unit tests, profilers, databases, GUI toolkits -- the list of specialized vernacular that you really *need* to know goes on and on!) isn't difficult! You are learning a language as rich as French or Sanskrit. But having a grasp of that language is essential to appreciating your classes: *If you are not learning at least as much about the computing profession from Google as from your classes, then you are not getting the most out of your education.*

How do you learn from the Internet? You play. Set up a server in your basement or build a website for your parents' shop, write a database to organize your MP3s. If you can, get a job or internship that involves programming, so someone else holds you accountable to learn. When you get stuck, use Google. Above all, *immerse* yourself.

It won't take long for you to start making connections between abstract ideas from class, like database normalization and Object Oriented design patterns, to problems that you recognize as pathological from your own experience. If you already know how to play the piano, talking about different ways to play (and the surrounding theory) will have a lot more life to it!

It doesn't take much -- you don't have to be an overachiever. I once spoke with a professor who makes his students write a 16,000 line Java project in a one-semester course. If you've done two projects even half that size by the time you graduate, then you're doing fine!

Your classes equip you to solve very difficult problems

It should be obvious to you right now that most of what you learn in CS classes isn't something you'll use every day, or perhaps ever *at all*, in your computing practice. OOP, databases and different types of programming languages are the bread and butter of modern computing -- but how often will you need to compute a minimum spanning tree of a graph, or solve a recurrence relation for the computational complexity of an algorithm?

In class, you learn such arcane nonsense as graph theory. This is because many every-day problems that mathematicians would call "combinatorial" can be expressed in that form. If you can phrase a problem you are facing in the language of graph theory, then you can tap into decades of computer science research that give you efficient algorithms for solving such problems.

Many other abstract frameworks exist in computer science for helping us recognize and solve problems, or come up with new algorithms for unsolved problems. Most of these will never matter to you (or even to most Ph.D.'s -- This is the 21st century: nobody can master their entire field anymore!). But that's exactly why they should matter: in any profession, the best-paying jobs involve solving problems that few others can. Specialization is almost as lucrative in computer science as it is in medicine!

As long as you are *playing* and learning on your own outside of class, then you'll be well on your way to becoming a good programmer. As long as you're taking your classes seriously, too, you'll be able to use what other people have learned about software engineering to improve your practice.

Don't lose sight of either the practical side of things ("programming") or the wider discourse ("computer science"). Above all, have fun! There is *no* reason for the practice of computing to be tedious!

"As long as you are playing and learning on your own outside of class, then you'll be well on your way to becoming a good programmer."

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The Synergizer

The name and Logo for the Engineering & Computer Science newsletter was designed by junior and senior ECS students.

Graduate Research: Joseph Abandoh—Sam

By Megan Mootoo

Software Engineering graduate student, Joseph Abandoh-Sam, and his partner Evans Lartey were awarded a $5000 grant from the National Collegiate Inventors and Innovators Alliance (NCIIA). The award was given in March 2012 to help fund a workshop for their system invented to eliminate loan shopping in the Ghanaian microfinance industry.

Abandoh-Sam explained that in Ghana there are no systems to track loan borrowers due to low coverage in the government's Social Security system. Most farmers and those in small scale businesses requiring loans from microfinance companies are not covered in the Ghanaian Social Security system. Collateral is necessary in order to obtain a loan and there are agents who check to ensure that those seeking loans are able to pay them back. However, there are some borrowers who engage in borrowing multiple times with other companies, an act called "loan shopping." Loan shoppers go to different micro financial companies, giving the same collateral to each company in order to receive a loan. This poses the risk that these loan shoppers will not be able to pay back all the loans they asked for. As a result, the risk of bad loan write-offs in these microfinance companies increases, limiting their ability to expand their services.

Lartey, a graduate student at the University of London International Program, and Abandoh-Sam have been researching for years on the risks that these loan shoppers cause. As a solution, the pair has developed a system to track down loan shoppers and lower risks to the Ghanaian economy. Abandoh-Sam and Lartey hope that after their workshop is complete, they can submit a new proposal to the NCIIA and receive $20,000 in grants to help fund their developing project.

The Synergizer Circus

By Mary Cregan

Every year the Engineering and Computer Science Department students hold an end-of-the-year assembly during the last Tuesday choices of the year.

This year, Josh Bissell decided to change things up and have juggling, yo-yoing and hacky sack demonstrations for all to participate in. He figured this would be a fun way to relieve stress as the semester comes to a close.

The assembly started with a song service followed by a short devotional thought. Next, there were students learning new tricks on the yo-yo, some students juggling, and a large group playing hacky sack. The assembly finished off with a slideshow of pictures from the year and prayer.