Spring 5-8-2014

College of Engineering Senior Design Competition Spring 2014

University of Nevada, Las Vegas

Senior Design

13th

Anniversary

Discover

the future of innovation...

Fred and Harriet Cox Spring 2014 Senior Design Competition

Thursday, May 8, 2014

UNLV | Howard R. Hughes College of Engineering

Fred and Harriet Cox Senior Design

Senior Design Experience

Part of every UNLV engineering student's academic experience, the Senior Design project stimulates engineering innovation and entrepreneurship. Each student in their senior year chooses, plans, designs and prototypes a product in this required element of the curriculum. Working in teams, the senior design project encourages students to use everything learned in the engineering and computer science programs to create a practical, real world solution to an engineering challenge.

Beyond the classroom...

Because of the requirement to work in teams, students also build good communication skills, presentation skills and even business writing skills. They also have to source and purchase the materials for the prototypes themselves, giving them real-world budgeting experience—all necessary skills to have in the business world.

Reward and recognition...

The rewards with Senior Design are great. A team of industry judges chooses winners in each category based on innovation, commercial potential, presentation quality and sustainability. A cash first prize and second prize are given in each discipline, as well as a grand prize. In addition, the College of Engineering—through the generosity of patrons Fred and Harriet Cox, as well as award sponsors—reimburses teams for the costs associated with creation of their prototype. This ensures that

teams are not working under unfair financial constraints, but have the resources they need to excel.

Awards are announced at an annual event in the spring, the Fred and Harriet Cox Senior Design Dinner. Nearly 600 faculty, staff, students and industry sponsors and partners attend to celebrate the achievements of these teams.

Taking it further...

Beginning in 2011, Senior Design teams were offered the opportunity to partner with MBA students from the Lee Business School who would create a business plan as part of their own curriculum. This collaboration has led to great success at both the Southern Nevada Business Plan Competition, and at the Governor's Cup. One LLC's have been created from Senior Design projects in the past year.

In addition, Engineering alumnus Chad Miller has offered pro bono services to file provisional patents on Senior Design projects. Teams who file a provisional patent are offered an additional financial incentive to do so. This academic year, eight teams have taken advantage of this opportunity and worked with Chad Miller at Weide & Miller, LLC to file.

Get Involved...

Teams often get project ideas from industry partners or friends of engineering who have an interesting problem or concept they would like to submit.

Teams may also be looking for an industry mentor or coach to help them throughout the year as they work on a project.

Industry partners and individuals are also offered the experience of sponsoring an award category. To find out what categories are available, or for other sponsorship information, contact Sara Portzel, Director of Development, at sara.portzel@unlv.edu or 895-2913.

Spring 2014 Senior Design Judges

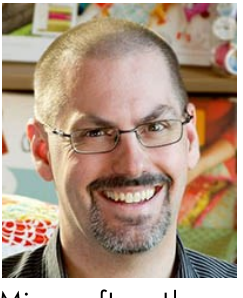
Dr. Brett Borup

Dr. Brett Borup is an Associate Professor in the Civil and Environmental Engineering Department at Brigham Young University where he has been employed since 1987. He teaches classes in environmental engineering and conducts research in the areas of water and wastewater treatment unit processes and operations. At BYU he also teaches the capstone course and is the faculty advisor for BYU's student chapter of the American Society of Civil Engineers. He has a Ph.D from Clemson University, an M.S. from Utah State University, and a B.S. from Humboldt State University. He is also a registered professional engineer.

Dr. Sarah Harris

Sarah Harris is an associate professor in the engineering department at Harvey Mudd College. She completed her Ph.D. in electrical engineering at Stanford University in 2005. Dr. Harris specializes in digital design, computer architecture, and embedded systems. Recent research topics include modeling cell signaling using electrical circuits, in collaboration with Martin Schiller, Professor in UNLV's School of Life Sciences.

Alex Peachey



Alex is the Director of Software for Originate and has the primary responsibility of leading Originate's software architects, advancing our software practice, and ensuring the use of modern industry standards, such as Behavior Driven Design (BDD). Alex finds new and innovative ways to encourage mentoring and training so that the engineering team can develop the best software in the industry. Alex has almost twenty years' experience in software and started his career working with Reynolds and Reynolds in partnership with Microsoft on the CarPoint website, then as CTO of CitySeats.com, an online event ticket market place. He also served as head of IT for the International Market Centers, the largest furniture wholesale marketplace in the country. Most recently he founded the Threadbias sewing community with a subscription service allowing quilt design in the browser. He received a bachelor's degree in Computer Science from Western Washington University and an MBA from the University of Washington and is an active contributor to the local Las Vegas developer community.

Jerome Roberts

Mr. Jerome Roberts is a Project Manager with National Security Technologies LLC in Las Vegas, NV. Mr. Roberts received his B.S. degree in Mechanical Engineering from the Georgia Institute of Technology in Atlanta, GA. Upon graduation, he accepted a design engineering position with E. I. DuPont at the Savannah River Site in Aiken, SC. After a twenty five-year career as a principle engineer at Savannah River Site, Mr. Roberts decided it was time for a change of scenery and moved to sunny Las Vegas, where he was offered a systems engineering position at the Nevada National Security Site.

Mr. Roberts has more than thirty years of experience as a licensed professional engineer, a project manager and an engineering manager. He has worked in the manufacturing, petroleum, chemical and nuclear industries and is active in the development of codes and standards for the nuclear industry. Mr. Roberts is also active with professional societies including ASHRAE and ASME.

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Thank you, Spring 2014 Senior Design instructors!

Department of Civil & Environmental Engineering and Construction
Dr. David Ashley

Department of Computer Science
Dr. Evangelos Yfantis

Department of Electrical and Computer Engineering
Mr. Brandon Blackstone

Entertainment Engineering and Design Program
Mr. Joe Aldridge

Department of Mechanical Engineering
Dr. Zhiyong Wang

Senior Design Competition

1	8:00 - 8:15 a.m.	Diverging Diamond Interchange (DDI)
2	8:15 - 8:30 a.m.	Clean Green
3	8:30 - 8:45 a.m.	S.O.L.A.R.
4	8:45 - 9:00 a.m.	Smart Parking Meter
5	9:00 - 9:15 a.m.	Pull-Me-Up Bar
6	9:15 - 9:30 a.m.	The Power Pit
7	9:30 - 9:45 a.m.	H-Eye Vacuum Vision
8	9:45 - 10:00 a.m.	Cashman Field Renovation
10:00 - 10:15 a.m. BREAK		
9	10:15 - 10:30 a.m.	Testbed Development for Geo-Location of RF Emitters
10	10:30 - 10:40 a.m.	Color Your World
11	10:40 - 10:55 a.m.	More Efficient PV Cell Disconnect with Test Structure
12	10:55 - 11:10 a.m.	Mitigating Flash Flooding: Redesigning City Parking
13	11:10 - 11:25 a.m.	Portable Gamma and Fast Neutron Detector
14	11:25 - 11:35 a.m.	Spectral Projections
15	11:35 - 11:45 a.m.	Free Attractions on the Strip
16	11:45 a.m. - 12:00 p.m.	GaN Ultra Violet Imager
12:00 - 1:00 p.m. LUNCH		
17	1:00 - 1:15 p.m.	CCRWD Service Facility Retro-Fit
18	1:15 - 1:30 p.m.	Diamond Anvil Cell Motorized Pressure Controller
19	1:30 - 1:45 p.m.	.Itty-Bitty ANC
20	1:45 - 2:00 p.m.	CH_4Sustainability
21	2:00 - 2:10 p.m.	adsAndFood
22	2:10 - 2:25 p.m.	Manual Horseshoe Bending Tool
23	2:25 - 2:40 p.m.	8-bit MIPS Processor
24	2:40 - 2:50 p.m.	BlackJack Game (iPhone App)
2:50 - 3:05 p.m. BREAK		
25	3:05 - 3:20 p.m.	growUP
26	3:20 - 3:35 p.m.	Bean Fiend Coffee Machine
27	3:35 - 3:50 p.m.	Algae Production System in Las Vegas
28	3:50 - 4:05 p.m.	RIANS
29	4:05 - 4:15 p.m.	Magic Light
30	4:15 - 4:30 p.m.	High Voltage Gallium Nitride Switching Power Supply

Presentation Schedule

	Civil & Environmental Engineering & Construction
	Civil & Environmental Engineering & Construction
	Mechanical Engineering
	Electrical & Computer Engineering
	Mechanical Engineering
	Mechanical Engineering
	Interdisciplinary
	Civil & Environmental Engineering & Construction
	Electrical & Computer Engineering
	Computer Science
	Electrical & Computer Engineering
Lots to Reduce Runoff	Civil & Environmental Engineering & Construction
	Mechanical Engineering
	Entertainment Engineering & Design
	Computer Science
	Electrical & Computer Engineering
	Civil & Environmental Engineering & Construction
	Mechanical Engineering
	Electrical & Computer Engineering
	Civil & Environmental Engineering & Construction
	Computer Science
	Mechanical Engineering
	Electrical & Computer Engineering
	Computer Science
	Civil & Environmental Engineering & Construction
	Mechanical Engineering
	Civil & Environmental Engineering & Construction
	Electrical & Computer Engineering
	Electrical & Computer Engineering
	Electrical & Computer Engineering

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 8:00 a.m.
Diverging Diamond Interchange (DDI)
Project Team: InterChangers
Department: Civil & Environmental Engineering & Construction
Project Participants: Tanner DuShane, Roxanne Feige, Kyle Mellies
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Mohamed Kaseko

Abstract:

Southern Las Vegas is a thriving area that is expected to continue growing for the next 10 years. With this growth comes increased traffic flow. The current interchange on Eastern Avenue and I-215 is in high demand. Morning and afternoon peak periods cause congestion along the Eastern Avenue underpass and the eastbound exit ramp on I-215. Traffic becomes so congested that vehicles create a queue onto the I-215 eastbound during the afternoon peak hours.

Our team, InterChangers, decided to redesign this interchange to allow for better traffic flow for commuters in southern Las Vegas. Implementing a Diverging Diamond Interchange (DDI) would decrease travel time through Eastern Avenue, improve the traffic flow, decrease vehicle stops, and reduce the amount of crashes. The Diverging Diamond Interchange was listed "Best of What's New 2009" by *Popular Science* magazine as one of the best innovations of the year.

A DDI will eliminate all turning signals. New traffic signals for the DDI will consist of through signals only. Vehicles will merge onto the I-215 without stopping at an additional light to make a left turn. For this process, drivers along the Eastern Avenue underpass will drive briefly on the opposite side of the road.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 8:15 a.m.
Clean Green
Project Team: Washboard ABS
Department: Civil & Environmental Engineering & Construction
Project Participants: Alexander Hoese, Brittany Radke, Suzanne Trabia
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Jacimaria Batista

Abstract:

Each month, over three million tourists visit Las Vegas with ambitions of "winning big." However, most often, they return home after leaving behind their money – and their dirty laundry. Brady Linen Services, LLC is a local industrial laundry facility responsible for washing the casinos' sheets, towels, and other linens. Each day at this facility, 700,000 gallons of softened water are required to wash 400,000 pounds of soiled linens. What the tourists leave behind consumes limited local resources for treatment and cleaning. In industrial laundry, it is fair to say, "What happens in Vegas," really does "stay in Vegas."

The purpose of this project was to update Brady's existing water softening system to minimize the cost, environmental impact, and energy consumption. In order to maintain the high quality of the linen, water used to wash the linens must be softened from a hardness of 285 mg/L of calcium carbonate ($CaCO_3$) to less than 17 mg/L. This project examined three different softening alternatives: reverse osmosis, lime soda softening, and ion exchange. Proper disposal methods of the softening process byproducts and waste water from the laundry facility were considered in this design. The alternatives were compared based on which has the lowest cost, energy usage, and environmental impact. Washboard ABS provided Brady with a sustainable, economical solution for water softening.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 8:30 a.m.
S.O.L.A.R.
Project Team: Radiant Sol Bugs
Department: Mechanical Engineering
Project Participants: Jack Cheney, Vachara "Bobby" Maneeraj, Nicole Ramos
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Robert Boehm
Technical Advisor: Mr. Rick Hurt
Community Advisor: Mr. Shawn Gerstenberger

Abstract:

In the ongoing territorial conflict between humans and insects, one type of species has the ability to invade human personal space while maintaining their own. Bed Bugs. Nocturnally active, these creatures crawl out and feed on warm blood leaving only an itchy swollen patch of skin. At the first sign of trouble, they scurry to their hidings spaces, such as corners, walls, beds, clothes, personal devices, and even books.

Books are our main focus for this project. Hiding within the spine of a book, bed bugs hide, lay their eggs, and multiply. Growing exponentially since the 1990s, bedbugs have become more resistant to pesticides. Therefore, instead of running the risk of damaging books with the typical bombardment of toxic chemicals and pesticides, a more 'green' approach was attempted: Solar Heating!

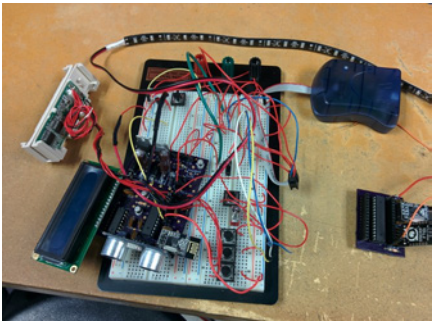
This team developed a black box that simulates the 'greenhouse' effect. Solar radiation passes through thick Plexiglas panels and is absorbed by the black panels in the box. Trapped within the box, the 'black body' panels radiate heat, increasing the temperature up to 80°C or 160°F. This is more than enough heat to eliminate our small bed-bug friends, which have been recorded to die at a temperature of 120°F.

Off-the-grid and environmentally safe, this natural 'microwave' can help provide alternative non-toxic sanitation. In the future, a larger scale model would be beneficial in killing bed bugs hiding in beds, chairs, and couches in places ranging from big resort hotels to your own personal home.

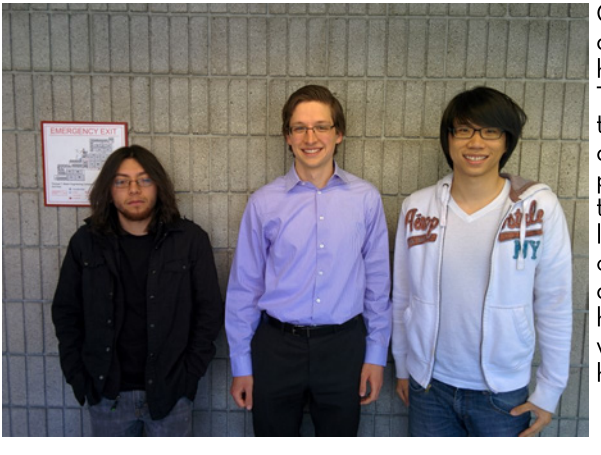
Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 8:45 a.m.
Smart Parking Meter
Project Team: Juvenile Parking
Department: Electrical and Computer Engineering
Project Participants: Parker Hill, Carlo Lopez-Tello, Jonathan Sha
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. Venkatesan Muthukumar

Abstract:
Parking meters throughout the country rely on obsolete practices. Drivers are expected to predetermine how long they will park and to constantly keep track of the time remaining on the meter. The city is required to patrol parking meters to issue tickets. Most parking meters require coins for payment. Although a few 'smart' parking meters exist, usually they are expensive to install. A large portion of this expense comes from the destruction of the parking spot in order to place a pressure sensor and construction of the sidewalk in order to place communication and power lines.



Our parking meter is entirely wireless. It detects cars by using an ultrasonic sensor. The power supply is an internal battery charged by a solar panel, and communications are done by an RF transceiver to an internet-connected hub. Therefore, it can be produced as a low-cost modular replacement for old systems, with all of the functionality expected from a modern system.



Left to right: Carlo Lopez-Tello, Parker Hill, Jonathan Sha

Our parking meter only accepts credit cards and has two modes of payment. The first payment mode is the usual pre-pay for a set amount of time. The second payment mode is to have the meter keep track of how long the car is parked; it will charge the credit card automatically after the car has left. People no longer will have to predetermine how long they need to park.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 9:00 a.m.
Pull-Me-Up Bar
Project Team: Half Animal
Department: Mechanical Engineering
Project Participants: Brandon Holten, Soren Peterson
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Brendan O'Toole
Community Advisor: Mr. Martin Garage

Abstract:
The Pull-Me-Up bar is a unique piece of work out equipment designed for the at-home user and fitness enthusiast. This mechanical apparatus attaches to any common residential doorframe. Within minutes, the user is performing the perfect pull-up with guided assistance training. This device aids the user by keeping their motion linear in nature and by counteracting the downward force asserted during a normal pull-up routine. The goal of the Pull-Me-Up bar is to train the user – and the major muscle groups involved – to contract in proper form, building muscular strength and endurance.

Common issues with the standard pull up, such as difficulty in completing a full-range pull up, can be remedied with this fun and unique machine. The user gains confidence with each repetition, giving them an overall sense of accomplishment as well as motivation to continue with their workout routine.

A classic patriotic color scheme brings the Pull-Me-Up bar to life with a vibrant and fun theme, ensuring the enjoyment of the user and bringing them back to use the machine again and again. The Pull-Me-Up bar delivers a convenient and fun alternative to expensive gym equipment and/or a gym membership.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 9:15 a.m.
The Power Pit
Project Team: B & M
Department: Mechanical Engineering
Project Participants: John Bowman, Drew Miller
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Yi-tung Chen

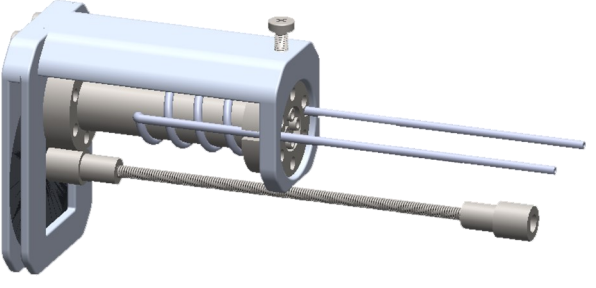
Abstract:

The Power Pit is a temperature-controlling, electricity-generating, indirect-heating, slow-smoking, and nearly autonomous barbecue grill that utilizes thermoelectric technology. Used for both commercial and residential barbeques, it can provide the necessary electrical energy to power its own temperature control system. Unlike traditional charcoal grill products, The Power Pit features a temperature-control system with meat probes that regulate internal meat temperatures; in addition, it has its own source of electrical energy. All of these features can be accessed and controlled by means of Wi-Fi connectivity, which is provided by The Power Pit as well. This technological advancement in BBQ will save time, money, and energy for outdoor cooking enthusiasts everywhere.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 9:30 a.m.
H-Eye Vacuum Vision
Project Team: The Quad
Department: Interdisciplinary
Project Participants: Leo Agpawa, Salman Jawhari, Larry Mittelstadt, Raymond Planas
Instructor: Mr. Brandon Blackstone, Dr. Zhiyong Wang
Technical Advisor: Mr. Stan Goldfarb

Abstract:



A space shuttle with no windows. A reconnaissance satellite with no cameras. A submarine with no periscope. All of these have one unthinkable thing in common: a monumental technological advancement with a lack of visibility. Humans have an inherent trait of desiring to reach for the impossible and – almost more important – to see the results. In today's world, the impossible is being reached in the most miniscule ways. Technological innovation is driven by increasingly smaller electronics, often assembled in vacuum chambers that provide the purest work environments.

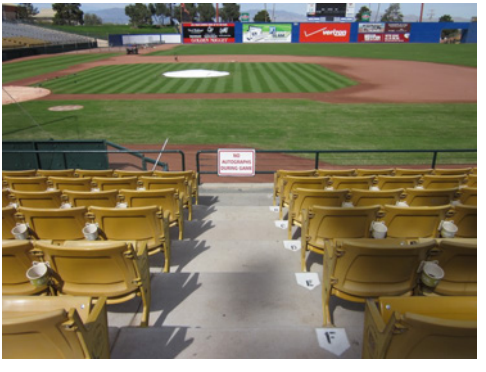
The problem with most vacuum chambers is a lack of visibility of the processes ongoing inside. Some chambers have small windows that provide limited viewing angles. While some companies do offer vacuum cameras, usually, these cameras are too big for some applications and are not properly protected for specific vacuum chamber processes.

The best solution is a camera small enough to fit into the smallest vacuum chambers, and includes an accessory that protects the camera and lens from specific chamber processes, such as those involving heat radiation and vapor deposition. This solution not satisfies human curiosity and also improves production efficiency by optimizing malfunction detection of the various components used in the vacuum chambers.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 9:45 a.m.
Cashman Field Renovation
Project Team: Cashman Field Renovation
Department: Civil & Environmental Engineering & Construction
Project Participants: Petros Berhanie, Mary Murphy, Thomas Porter, Alexy Serrano
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Mohamed Kaseko
Technical Advisor: Mr. David Cooper

Abstract:



Sports evoke a passion in all the members of our group. As aspiring engineers, we wanted to incorporate an engineering approach to something we love. With all the talk about building a new stadium in the Las Vegas Valley, existing stadiums would suffer due to the new competition. This is where The Cashman Field Renovation comes into play. After a hard day of work, going to see the 51s play baseball is relaxing and a tradition here in the Las Vegas Valley. However, let's face it: some improvements could be made.

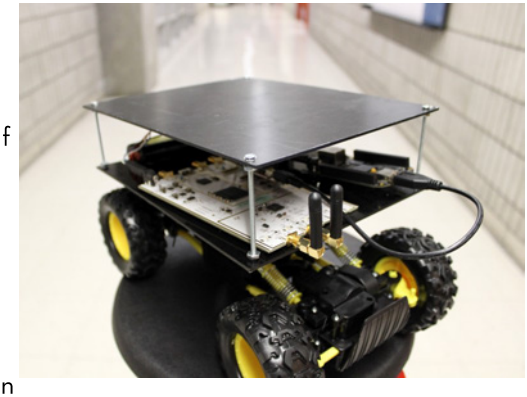
That is how this idea came into being. By combining our passion for sports and our engineering skills, we have proposed the following senior design. Our first target is to widen the concourse at Cashman Field. Esthetically, it has many cracks, which does not look very appealing. In addition, workers have trouble accessing different ends of the field because of the concourse's width limitation. We propose to extend the concourse and remove one row of seats; to this end, we have conducted an economic analysis regarding this idea. For example, Cashman Field has a seating capacity of 9,334 but only has a regular attendance of 7,000 people. Removing a row of seats will not cause any inconvenience in seating.

Another idea involves changing the stadium to a multipurpose stadium that hosts soccer games during baseball's off-season. This involves changing the field from a baseball field to a soccer field, and vice versa. With the new stadium coming in, this definitely is a good idea for expansion.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 10:15 a.m.
Testbed Development for Geo-Location of RF Emitters
Project Team: What is Toronto
Department: Electrical & Computer Engineering
Project Participants: Ken Adams, Joshua Aurich, Braxon Tawatao
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. Shahram Latifi

Abstract:



Methods for discovering the physical origin of radio signals exist today; however, they are bulky, power-hungry, and expensive. In order to promote emerging ideas, the military has an interest in utilizing off-the-shelf components when solving complex geo-location problems. In addition, these components help to mitigate costs while limiting the size, weight, and power for many applications, especially those pertaining to unmanned aerial vehicles (UAVs).

Tasked by U. S. Air Force Research Labs and funded by the Ohio Aviation Institute, the task for our team was to develop a test bed for the geo-location of radio frequency emitters. Utilizing a distributed system of multiple lightweight, mobile sensors, we can detect radio emissions and process real-time data to predict the location of a target accurately.

Although this project was developed for delivery to the U.S. Air Force, the system has numerous other applications in both commercial and civilian sectors.

Left to right: Joshua Aurich, Ken Adams, Braxon Tawatao

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 10:30 a.m.
Color Your World
Project Team: Jason Morrison
Department: Computer Science
Project Participant: Jason Morrison
Instructor: Dr. Evangelos Yfantis

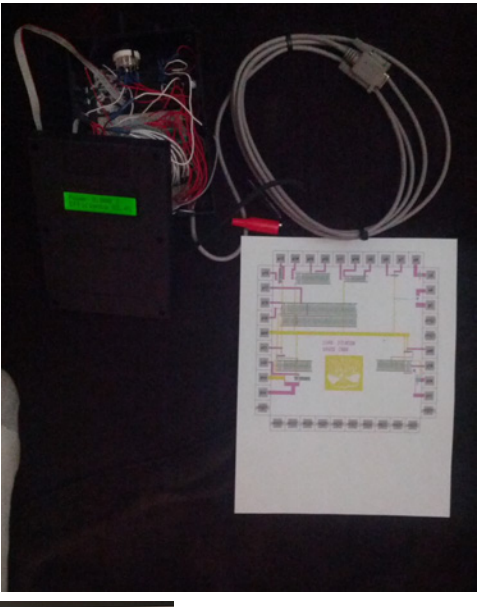
Abstract:
Color Your World is an easy-to-use mobile app for photo editing. I have struggled with differentiating certain colors when there was no reference color for comparison, so I wanted to create an app that quickly and easily could aid me in identifying and altering a color of my choice. The app provides the entire hue spectrum for color comparisons and color swapping; this makes it much easier to notice slight hue differences in a photo.

With the idea that identifying colors should be easy, I wanted to include a feature for people with deuteranopia, also known as red-green color blindness. By pressing a single button, the app can remove all of the red or green color in a photo. The app is not specifically designed for people that have trouble with colors, however. Primarily, it is a fun tool for anybody in order to change colors of their photos when on the go.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 10:40 a.m.
More Efficient PV Cell Disconnect with Test Structure
Project Team: The PV Cell Disconnect Heros
Department: Electrical & Computer Engineering
Project Participants: David Carr, Chad Johnson
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Jacob Baker

Abstract:
Photovoltaic cells used to charge rechargeable batteries are required to be disconnected electrically from the battery when not supplying power. Thus, it is of interest to establish electric disconnection with minimum power loss. This paper details a Senior Design project directed at obtaining a more efficient method of achieving the necessary disconnect on an integrated circuit used for small photovoltaic systems. A test structure was constructed to correlate the efficiency of this disconnect with multiple system parameters, such as battery voltage, photovoltaic (PV) cell voltage, and PV cell current.



Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 10:55 a.m.
Mitigating Flash Flooding: Redesigning City Parking Lots to Reduce Runoff
Project Team: Retro Flow
Department: Civil & Environmental Engineering & Construction
Project Participants: Lauren Jacobs, Desmond Tan, Timothy Yee
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Haroon Stephen
Technical Advisor: Mr. Albert Jankowiak

Abstract:
On September 12, 2012, Las Vegas experienced heavy rainfall that led to flash flooding and affected various parts of the UNLV campus. In particular, flash flooding greatly affected the Black Lot near the Thomas and Mack Center. The rainfall depth recorded for the Black Lot and surrounding area was 1.18 inches. Further, this flash flooding caused great inconvenience to the students, and rendered parts of the Black Lot useless. In some areas, cars were sitting in 22 inches of water. Textbooks in the cars were ruined, students were stranded, and cars were damaged.

Team Retro Flow has undertaken to develop and analyze three design alternatives to mitigate future flash floods of this caliber. These three design alternatives are:

1. Swale design
2. Pervious concrete design
3. Re-grade pavement design

Design alternatives were analyzed to reduce the floodwater depth, the duration for floodwater to subside, cost, and sustainability. Each design alternative was simulated with ArcGIS software to determine which design was the best for mitigating future flash floods in the Black Lot.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 11:10 a.m.
Portable Gamma and Fast Neutron Detector
Project Team: N.E.R.D.
Department: Mechanical Engineering
Project Participants: Kyle Lanza, Emily Weill, Kevin Yim
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Alexander Barzilov

Abstract:
Radiation detectors commonly are used in laboratories for research or for national security purposes by such organizations as the Defense Threat Reduction Agency (DTRA), Domestic Nuclear Detection Office, Department of Homeland Security, and the National Nuclear Security Agency. Current detectors require gas-filled tubes that are delicate and bulky. The Portable Gamma and Fast Neutron Detector is a radiation sensor that utilizes a newly developed optical transducer array in series with a plastic scintillator. It creates photons from the incident gamma rays and fast neutron particles, which are collected by the array where a voltage signal is generated, corresponding to the radiation's quantity, quality, and type.

Our detector is the first of its kind with these components. By means of an LCD screen, it displays the radiation type and count rate, and transmits data wirelessly by means of WIFI to any receiving device, such as a computer. The detector is housed in a handheld casing for portability and attached to a vehicle for improved protection of the user. The vehicle carries the detector into unsafe areas and transmits the radiation data, while the users remain at a safe distance. The detector is non-toxic, durable, cheaper than current detectors, compact, modular, and portable. One of the most important aspects of this product is its ease of use: just turn on the handheld device and it displays the radiation data in real time. Moreover, it is portable.

Left to right: Emily Weill, Kevin Yim, Kyle Lanza

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 11:25 a.m.
Spectral Projection
Project Team: Fatale Attractions
Department: Entertainment Engineering & Design
Project Participant: Shelby Honea
Instructor: Dr. Joe Aldridge
Faculty Advisor: Dr. Mike Genova

Abstract:
The Haunted House industry is the largest representative of a growing facet of the live entertainment industry, known as Experiential Entertainment. Haunted Houses and other similar attractions use scenic elements, lighting, technology, and live actors to entertain their guests immersively. A survey of Haunt operators found that their greatest challenge was novelty – having something 'new' to offer each season. It is essential for attractions to utilize low-cost enhancements as an enticement to motivate visitors to return.

The Spectral Projection lighting system is a guest-operated handheld prop that opens up a world of customization and innovation. The product allows the guest to experience an attraction in an entirely new way. Moreover, it allows Haunt operators to enhance and change their attraction regularly. The system, meant to look like a normal flashlight, leads guests through the maze; it supplements the design of the house and performance of the actors. The use of micro-controllers with scenic, projected, and actor-driven elements create a multi-sensory experience.

Alternative uses for this system outside of Haunted Houses include museums, science centers, and family entertainment centers.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 11:35 a.m.
Free Attractions on the Strip
Project Team: Cheema
Department: Computer Science
Project Participant: Bina Cheema
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:

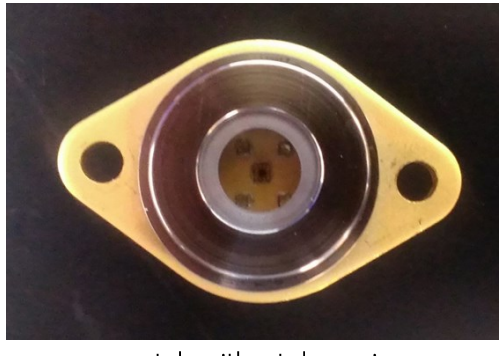
This app provides a guide to the top free attractions on the Las Vegas Strip. Why pay a penny when you can do unique and interesting things for free? Once you select an attraction, it is only a click away to get a detailed description of what you are interested in. The text to the speech feature lets you sit back and relax while it reads the information for you. In addition, you can click on the map to get the exact location of the attraction instead of searching it in the online maps.

Check this app out to enjoy your trip in the wonderful city of Las Vegas. “Viva Las Vegas!”

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 11:45 a.m.
GaN Ultra Violet Imager
Project Team: Sub Violet
Department: Electrical & Computer Engineering
Project Participants: Derek Constantino, Vince DiPuccio
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. Ke-Xun Sun

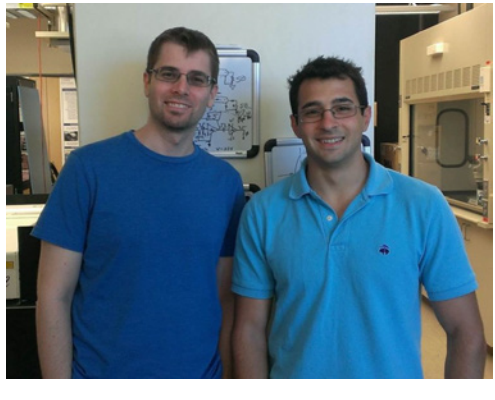
Abstract:



Gallium Nitride (GaN) has many properties that make it an attractive material to use in the next generation of semiconductor devices, particularly in nuclear and space applications. Some of these properties include a high dielectric strength; fast electron mobility; a wide band gap; higher operating temperatures; and most importantly, being radiation hard.

No electronic device today is capable of withstanding the radiation produced by nuclear fusion; therefore, there is no way to monitor the fusion process accurately without damaging semiconductor devices, specifically the P-N junction. A huge cost in space exploration comes from the shielding required to protect silicon instrumentation from the radiation in space. Gallium Nitride technology, with its radiation hardness, will help drastically reduce the cost of satellites by rendering these shields unnecessary.

Our goal is to create an imager that operates in the ultraviolet spectrum, which is very useful for monitoring nuclear processes as well as imaging celestial bodies in space. This imager will function after exposure to radiation equivalent to being in a nuclear reactor or being in space for an extended duration of time. The imager will sustain radiation far beyond the limit that modern electronics can withstand.



Left to right:
Derek Constantino, Vincent DiPuccio

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 1:00 p.m.
CCRWD Service Facility Retro-Fit
Project Team: Urban Flow Riderz
Department: Civil & Environmental Engineering & Construction
Project Participants: Dominic Panaligan, Shayan Seddigh, Jordan Torrella, Timmie Winston Jr.
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Haroon Stephen
Technical Advisor: Mr. Allen E. Pavelka

Abstract:
The objective of the Urban Flow Riderz is to address issues of storm water run-off within the Clark County Water Reclamation District Services Facility. Our clients, who are the coordinators on the site, described a problem of ponding and excess storm water flowing off-site.

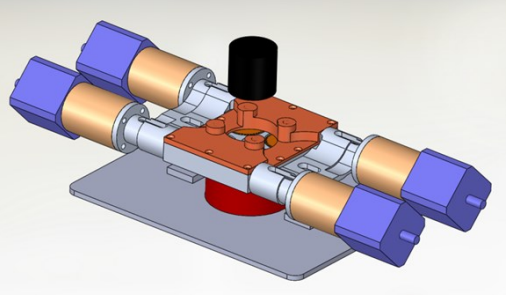
The design objective is to retrofit the facility in order to redirect the flow towards the Monson Channel while maintaining a sustainable design by using best management practices to regulate the substances within the outflow.

Left to right:
Jordan Torrella,
Timmie Winston Jr.,
Shayan Seddigh,
Dominic Panaligan

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 1:15 p.m.
Diamond Anvil Cell Motorized Pressure Controller (DACMPC)
Project Team: DACC
Department: Mechanical Engineering
Project Participants: Alberto Burguneo, Cesar Giron, Neema Khalili
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Kristina Lapinska, Dr. Mohamed Trabia

Abstract:



A Diamond Anvil Cell is used to test the properties of a sample material. The way scientists test these properties is by placing a small piece of material inside the Diamond Anvil Cell, increasing the pressure, and reading the material's properties with lasers. Dr. Kristina Lapinska, along with most scientists, must first remove the cell from the viewing stage before tightening the Diamond Anvil Cell, using Allan keys to increase the pressure by hand. Failure to tighten all four screws simultaneously can result in shattered diamonds.

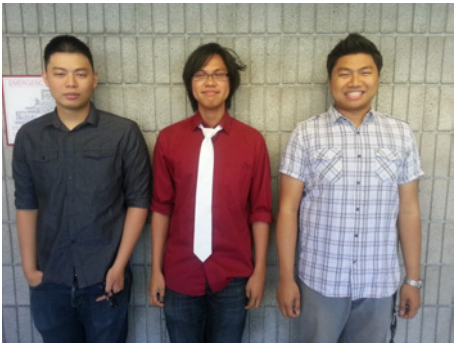
We have engineered a motorized device that can tighten all four screws accurately and efficiently with an even load while the cell stays on the viewing stage. Controlled with a computer, this device allows scientists to increase pressure inside the cell while continuously recording their results.

Left to right:
Alberto Burguneo,
Cesar Giron,
Neema Khalili

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 1:30 p.m.
.Itty-Bitty ANC
Project Team: m^3-audIO
Department: Electrical & Computer Engineering
Project Participants: Marc Canlas, Mark Chua, Mico Manio
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. Eugene McGaugh
Technical Advisor: Dr. Brendan Morris

Abstract:



"What?"
Pushing your meal aside, you lean over the table and repeat yourself, "Was the dish good!?"
Your friend's forehead furrows in confusion as they cup an ear and shout out another, "What!?"
Your reply, "Nevermind!" is followed by another drowned "What?!" as you sit back down at your seat. Taking another sip of your drink, you can feel it burn on the way down as you realize you've been screaming over the other patrons for the last hour.
In a restaurant, sound levels can reach up to 80 - 100 dB. For comparison, face-to-face conversation at 3 feet is approximately 65 dB, and a blender at the same distance is approximately 88 dB. At 90-95 dB, sustained exposure to the sound can result in hearing loss.
In closed establishments, such as restaurants, the sound problem is elevated when patrons try to shout over a loud crowd. Our project focused on noise reduction in public spaces - such as restaurants and hospitals - through both passive and active means.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 1:45 p.m.
CH_4 Sustainability
Project Team: Civil Solutions
Department: Civil & Environmental Engineering & Construction
Project Participants: Milad Alan, LeAndra Nelson, Sean Teague, Ricardo Vallejos
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Daniel Gerrity
Community Advisor: The Animal Foundation

Abstract:

Every day, the people of Las Vegas take their dogs for walks. During these walks, their dogs often leave remains behind. The feces the dogs produce are thrown away and sent to landfills. However, sending the remains to landfills contributes to the 17% of methane emitted by landfills in the U.S. annually [1]. Methane, as a greenhouse gas, is 20 times more potent than carbon dioxide over a 100 year period [1].

One way to control these emissions is through the process of anaerobic digestion. This process breaks down the wastes, thereby creating and storing methane in order to produce energy. The methane is burned and converted into water and carbon dioxide, a more favorable greenhouse gas [2].

One potential location for an anaerobic digester would be alongside an animal shelter. By designing the reactor next to an animal shelter, there would be a plentiful supply of feed for the digester. By taking advantage of this previously untapped source of energy, the effects of greenhouse gas emissions could be reduced while providing a sustainable energy source for the shelter. The Animal Foundation, a local Las Vegas animal shelter, was chosen as the location for this project. Three types of anaerobic digesters were designed and analyzed, along with two generators for power conversion.

This process is not limited to animal shelters. If all dog wastes were collected and used in anaerobic digestion processes, more methane – and therefore more power – could be generated.

[1] Environmental Protection Agency, "Overview of Greenhouse Gases- Methane Emissions." Available: http://epa.gov/climatechange/ghgemissions/gases/ch4.html. [Accessed 23 3 2014].

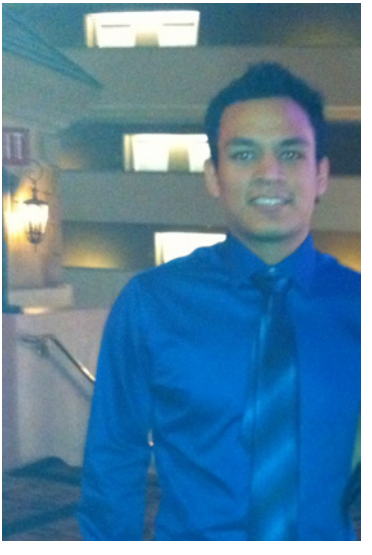
[2] D. N. Blauch, "Heat of Combustion of Methane," 2000-2014. Available: http://www.chm.davidson.edu/vce/calorimetry/heatofcombustionofmethane.html. [Accessed 2014].

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 2:00 p.m.
adsAndFood
Project Team: darizCo
Department: Computer Science
Project Participant: Bryan Armendariz
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
This application, which is simple and useful, can find any restaurant based on a user's current location. The app shows only the places of interest– for example, one that features a specific type of food within a given location; further, it show many details for each restaurant. This was implemented by means of integrating the Google Places API in the IOS environment.

People often have a difficult time choosing new places to eat; this app will help this need. In the future, this application will be expanded to provide more restaurant-specific information.



Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 2:10 p.m.
Manual Horseshoe Bending Tool
Project Team: AC^2
Department: Mechanical Engineering
Project Participants: Cody Bostick, Aaron Butler, Cody Helbert
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Brendan O'Toole

Abstract:
This team developed a new farrier tool designed to compress a horseshoe locally while it was partially attached to the horse during the shoeing process. The tool uses two compound hinges that maximize leverage, creating a bending force much stronger than the force applied at the handles. The tool only needs to reshape the shoe between existing standard sizes.

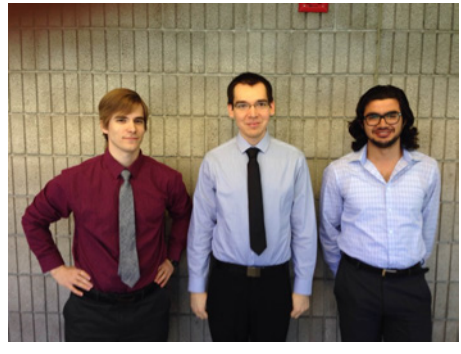
The objective of this tool is to eliminate the traditional method of shaping and bending horseshoes. Traditionally, if a standard horseshoe is slightly larger than the horse's hoof, the method to compress the shoe involves heating the shoe in a furnace until the metal becomes malleable and applying impact force with an anvil and hammer. This process is imprecise, and occurs takes the farrier away from the horse. Our new tool design eliminates the need to remove the shoe from the horse completely and provides the farrier with a more time and cost efficient alternative.

An adjustable cam system is implemented at the contact area of the tool, which allows the tool to accommodate a range of horseshoe sizes. The desired displacement of the tip of the horseshoe is only one-third of an inch. Our prototype is made from low carbon steel, and weighs approximately two pounds. The tool creates a mechanical advantage of 25.6. Therefore, a 45-pound grip can create an output force of 2300 pounds. The maximum displacement at the end of the horseshoe is approximately 0.47 of an inch.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

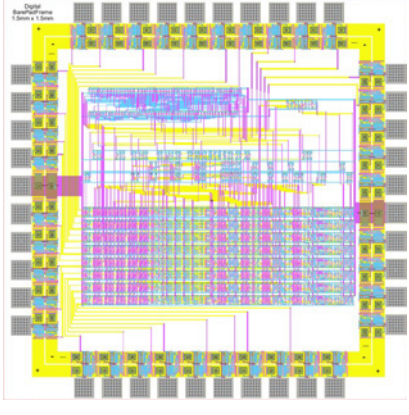
Time: 2:25 p.m.
8-Bit MIPS Processor
Project Team: 8-BIT
Department: Electrical & Computer Engineering
Project Participants: Mohammed Al-Karawi, John Enyeart, Ruben Medina
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. R. Jacob Baker

Abstract:



A MIPS processor is one version of a reduced instruction set computer (RISC). It is a model that is studied often in university courses on computer architecture because it has enough complexity to include all the main aspects of modern processors. However, it isn't overly complex so as to bog students down in the details. MIPS processors have been around since the early 1980s, and have gained popularity in the 1990s. It was estimated that one third of all RISC processors used the MIPS architecture, including embedded systems for the Sony PlayStation 2 and the PlayStation Portable.

Our motivation was to produce a processor that could be used for educational purposes in university classrooms. The steps that we took to design and fabricate this processor could be documented and used as a set of labs for an electronics class, for example. Everything we are using in this project is freely available for educational purposes. The design software is available for free online, and even the chip fabrication by means of Metal Oxide Semiconductor Implementation System (MOSIS) is free for educational projects. Therefore, as a tool for students and teachers, it has a large potential value.



Further, the design and testing of the processor is a good application of skills we have accumulated over the course of our college career, requiring knowledge of electrical and computer engineering in order to accomplish this project.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 2:40 p.m.
BlackJack Game (iPhone App)
Project Team: Stefan Kirov
Department: Computer Science
Project Participant: Stefan Kirov
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
This project presents a full-featured Black Jack game for the iPhone. This is a common casino game; further, Las Vegas Casinos and Hotels or other gaming companies can used this app as good promotional material as well as an inexpensive marketing tool. Distributed free on the app store, it will deliver customized offers to its users in the form of Casino and Hotel ads for Las Vegas or ads for other more sophisticated slot (casino) games to be purchased. In addition, the app may include options for users to purchase credits to play more or to get more credits by actually clicking on ads.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 3:05 p.m.
growUP
Project Team: Cultivate Consultants
Department: Civil & Environmental Engineering & Construction
Project Participants: Ernie Corn, Nicholas Eggen, Ami Ilagan, Layla Rouas
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Haroon Stephen
Technical Advisor: Mr. Joe Farre

Abstract:

Agriculture is, and has been, the primary source of food for humankind. With the earth's population larger than ever and continually growing, feeding the seven billion people on this planet requires immense resources. Agriculture requires extensive land; 70% of the world's fresh water supply; 20% of all fossil fuels burned annually; and a complex network of production, transportation, and distribution services. Additionally, traditional farming practices place crops far from the consumers and under the threat of unfit environmental conditions. Right here in Las Vegas, millions of residents and visitors are supported annually on food that is transported primarily from traditional farming locations. The solution to this unsustainable practice is to 'growUP'. Vertical farming is a technology that seeks to eliminate or reduce all hindrances that beset traditional agriculture. Vertical farming entails growing crops within environmentally controlled structures in urban areas, reducing water and fuel consumption, minimizing land area, eliminating transportation impacts, and reducing product costs. Our team, Cultivate Consultants, has designed the growUP Urban Food Solution, a vertical farm designed with the capability of being retrofitted atop any existing parking garage. This approach utilizes the height of a multistory building while eliminating the economic and material cost of building a new one. growUP's design consists of the building structure and all necessary components to produce crops for human consumption.
Cultivate Consultants selected an initial, exemplary location to model growUP's potential. This system has the capability to exist anywhere a parking garage does, changing the way the world eats.

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 3:20 p.m.
Bean Fiend Coffee Machine
Project Team: Bean Fiends
Department: Mechanical Engineering
Project Participants: Russell Fitzpatrick, Blake Naccarato, Beaujolais Wright
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. William Culbreth

Abstract:

In the realm of coffee machines, the market is limited to drip brewers and espresso makers. These models are seen in offices, homes, and businesses around the world, producing coffee for the masses. However, there has been a recent upswing in the demand for individualized coffee machines. They quickly produce a single cup of coffee for the user on the go. Keurig and other coffee manufacturers have been catering to this market with easy-to-produce drip brewers. However, the major drawback is that they tend to over-extract flavor from coffee beans, producing bitter coffee. A full-immersion brewer, such as the French press, allows for precise control of the coffee's flavor. A method similar to this device has yet to be automated for the home, until today.

The Bean Fiend Coffee Machine bridges the gap between the precise but slow manual devices, such as the French press, and fast but sloppy automatic machines. It grinds coffee beans, heats water, combines the two in a chamber, and presses the freshly brewed coffee into a mug. It is programmable to the user's liking, allowing brew time, water temperature, grind size, and more to be optimized. It produces flavorful coffee with a simple cleanup–it is a coffee connoisseur's dream and a welcome alternative to automatic drip brewers.

Left to right: Beaujolais Wright, Russell Fitzpatrick, Blake Naccarato

Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 3:35 p.m.
Algae Production System in Las Vegas
Project Team: Team MAG
Department: Civil & Environmental Engineering & Construction
Project Participants: Gregory Bock, Mike Jelenek, Adam Martinez
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Daniel Gerrity
Technical Advisor: Mr. Joe Leising

Abstract:
Team MAG has devised a plan for an algae culture system in Las Vegas using the shallow groundwater system as a renewable source of water. Recently, algae growth has become big business globally, with over 50 companies in the United States producing algae on an industrial scale. The climate within the region of Las Vegas is perfect for the growth of algae, and the saline groundwater is an ideal water source for algae production. The shallow groundwater system, colloquially referred to as the saline aquifer, currently has no designated practical use. This is because its high saline content makes it unsuitable for drinking.

As a pilot study plant, our design analyzes all the aspects of constructing and utilizing the growth of algae by using 5,000 gallons of water. This design for algae culture is meant to produce an aquaculture feed source. By means of alternative analysis, the project group has chosen a pond design with an open raceway and built with concrete.

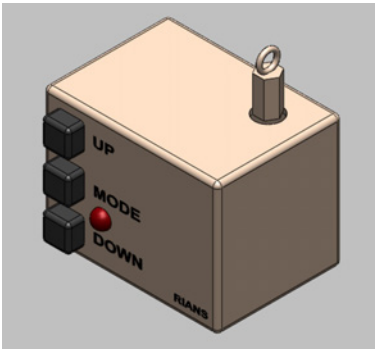
Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 3:50 p.m.
RIANS
Project Team: Ryan W. Hedderly & Ryan J. Mortenson
Department: Electrical & Computer Engineering
Project Participants: Ryan Hedderly, Ryan Mortenson
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. Sahjendra Singh

Abstract:
The Room Illumination Adjustment Normalization System, RIANS, was the result of the collaboration of two people named Ryan, pun intended.

Ryan Mortenson proposed this idea originally in the fall of 2012, after sitting in his house one day enjoying the delightful smell coming from his automatic scent dispenser placed on his bookshelf. He thought, "Why cannot more items around the house automatically adjust things in our home?"

The next thought pertained to the lighting in the room, and thus the shades– the RIANS.

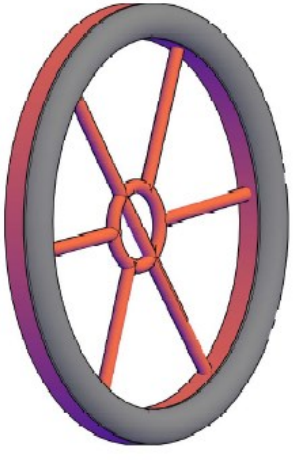


Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 4:05 p.m.
Magic Light
Project Team: Isaac Jarez
Department: Electrical & Computer Engineering
Project Participant: Isaac Jarez
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. Venkatesan Muthukumar

Abstract:
A camera flash or video light usually consists of single bright light. This mono-directional light causes shadows and other distortions of the subject. While this is desirable for more artistic subjects, especially when photographing people, when a more well-rounded light source would be desirable. Currently, photographers use several lights to provide this omni-directional light.

This project named "The Ring" would provide 360 degrees of light. Currently, the market sells LED banks in a square formation, whose construction is made from ordinary low power LEDs. While they are power efficient and lightweight, their brightness is contingent on a high number of LEDs. The Ring will be designed using high brightness LEDs (HBLED) in order to reduce the number of LEDs used as well as the size and weight of the flash.



Senior Design Project Abstracts
Cox Pavilion
May 8, 2014

Time: 4:15 p.m.
High Voltage Gallium Nitride Switching Power Supply
Project Team: Shocker
Department: Electrical & Computer Engineering
Project Participants: Dustin Calhoun, Stryder Loveday
Instructor: Mr. Brandon Blackstone
Faculty Advisor: Dr. Ke-Xun Sun

Abstract:
The Shocker project is an attempt to display the potential advantages of Gallium Nitride (GaN) in commercial use as a metal-oxide-semiconductor field-effect transistor (MOSFET) that has high-voltage high-speed power. Historically, GaN chips have been very difficult to produce on a large scale; however, recent breakthroughs increasingly make them viable commercially.

Our intent is to demonstrate a more efficient design that eliminates the need for bulky, inefficient transformers, which is a major efficiency drain on modern-day power supplies. Our design, which utilizes high-voltage, high-speed GaN MOSFETs, is capable of greatly increased switching speed, which allows for considerably smaller transformers and results in a higher power density. Further, our design takes advantage of the short transition width of GaN MOSFETs, therefore greatly reducing switching losses. Our current design takes a standard 120-volt input and outputs 1000 volts, with a maximum designed current of 0.1 amps, totaling 100 watts of power delivered to a load.

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