Experience excellence in innovation...

Fred and Harriet Cox
Fall 2012
Senior Design Competition
Wednesday, December 5, 2012
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 design 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. Two 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. In 2012, several 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.
Fall 2012 Senior Design Judges

Ken Alber
Ken Alber is principal and co-founder of The PENTA Building Group, along with colleagues Jeff Ehret and Blake Anderson. Ken is responsible for the Preconstruction Department and ensuring business acquisitions maintain and support the financial stability of the company.

With more than 25 years of experience, Ken has served as a Project Manager on some of the largest resort hotel and casino projects in Las Vegas, including Paris Hotel Casino, Luxor, and Aliante Casino + Hotel. Ken earned his bachelor of science in civil engineering from the University of Akron and an MBA from the University of Phoenix.

Bradford Colton
Bradford Colton is the intellectual property manager for American Pacific Corporation, in addition to serving as a Research Engineer in the company’s Halotron Division, which manufactures clean fire extinguishing agents. Through his position in the support and technical development of fire extinguishing products, he has been directly involved in all aspects of certification and commercialization.

Bradford has been with American Pacific since 1995, becoming involved with intellectual property management in 2003. He has a bachelor’s degree in mechanical engineering from UNLV.

Bala Kuthyar
Currently working at Bally Technologies as Vice President of Engineering, Bala Kuthyar is responsible for the Research & Development of Bally Gaming Platform, which provides a common platform to build innovative games across various markets and jurisdictions. He previously managed the Business Intelligence products, including Data Warehousing, Data Visualization and CRM/Marketing applications, like Campaign Management, at Bally Systems Division.

Prior to joining Bally Technologies, Bala worked at Manhattan Associates Inc. Bala has worked in the software industry for the past 29 years, with a broad variety of technologies and processes, with a special focus on gaming, ERP, and supply chain planning and execution. He holds a bachelor’s degree in electronics and computer engineering.

Igor Tsapenko
Igor Tsapenko is the Director of Applications Engineering at Aldec Inc., a global Electronic Design Automation tool vendor headquartered in Henderson. He started his career with Aldec in 2002, as Research & Development Engineer in the Hardware Emulation Division, and later moved to the Field Applications Group, specializing in supporting Functional Verification and Hardware Emulation tools.

Igor holds bachelor’s and master’s degrees in computer engineering from Donetsk Technical University in Ukraine.
Thanks to our Award Sponsors!

Grand Prize

National Security Technologies, LLC
Vision • Service • Partnership

Civil and Environmental Engineering and Construction

Computer Science

Electrical and Computer Engineering

Entertainment Engineering and Design

Mechanical Engineering

Commercial Potential

Sustainability

To Be Announced

NV Energy

Zappos.com

the web's most popular shoe store!

JT3

CIRQUE DU SOLEIL

switch

Dominic Anthony Marrocco
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<td>Automatic Bottle Capper</td>
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<td>PRESENTATION 2</td>
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<td>PRESENTATION 5</td>
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<td>PRESENTATION 7</td>
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<td>9th Island Wave Pool</td>
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<td>PRESENTATION 8</td>
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<td>PRESENTATION 9</td>
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<td>PRESENTATION 10</td>
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<td>PRESENTATION 12</td>
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# Senior Design Competition

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Automatic Bottle Capper

Department: Mechanical Engineering

Project Team: Team ABC

Project Participants: Tony Filipiak, Daniel Sigler, Amber Sypien, Zheng “Jinger” Zeng

Instructor: Dr. Zhiyong Wang

Faculty Advisor: Dr. Brendan O’Toole

Abstract:
The Automatic Bottle Capper (ABC) is designed as a small kitchen appliance that replaces the conventional crimping tool used in glass bottle capping at home. The target market of the product is the homebrew hobbyist who makes beer and other carbonated beverages. The product improves the mechanics of the capping process, and implements automatic controls with a feedback system.

The ABC will reduce the number of bottles broken in the homebrew bottling process by using an engineered mechanism design and control methodology. The mechanical components consist of a frame for housing that can be easily assembled and disassembled; a 3-jaw centering prawn mechanism to center and hold the bottle; and a capping die, driven by a linear actuator, for applying the vertical crimping force. A controller is designed and programmed to drive the centering mechanism and linear actuator, ensuring alignment precision and accuracy.

The ABC fits perfectly in the market for modern kitchen gadgets, which has become increasingly popular. It will be released as an open-source kit to meet the “Do It Yourself” tendencies of typical homebrew hobbyists. Hopefully, this gadget will become their new favorite table-top appliance.

Abstract:
A propagating wave through a medium can be quantified by the change of its phase and magnitude. The difference in the wave's characteristics can be represented as a complex wavenumber. This project will be designed and fabricated to be able to measure this complex wavenumber using the In-phase/Quadrature (I/Q) channel detector.

The detection system allows the user to determine phase and amplitude of a given radio frequency (RF) signal propagating through a medium. This is done by extracting the radian phase-shift and the ratio of the phasor magnitudes at a 10-GHz frequency. The in-phase and the quadrature channels are then decomposed into a free-space reference value plus a differential component, due to the presence of a medium. The output then can be manipulated by adjusting the gain to generate data to represent the perturbed RF signal.
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 9:00 a.m.
Asterandroids
Department: Computer Science
Project Participant: Shawn Cannon
Instructor: Dr. Evangelos Yfantis

Abstract:
Asterandroids is a game project designed to allow users to interact with an environment and manage their resources in such a way to advance in the game. The main premise behind Asterandroids is the production of small robots equipped with various tools; the user sends them into an asteroid field to search for useful materials beneath the surface.

As you discover materials and scientific marvels on these asteroids, you attain wealth in exchange. And with that wealth, you can increase your efficiency, productivity, and the ability to reach other asteroids. Eventually you will be able to refine the materials that you gather to increase their value as well.

There will be many upgrades and incremental gameplay rewards to keep the game interesting and fun. There will be several different modes to this game. Each mode will have different smaller goals that bring you closer to the major goal of getting rich quickly in the lucrative trade of deep-space mining. Phases of the game include building robots, assigning tasks, taking remote control of your androids, and exploring on your own.
Abstract:
Millions of individuals suffer from work-related injuries every year. Not only can these injuries cause permanent physical and psychological damage, but they have also cost the nation an estimated total of 250 billion dollars every year. Some of these injuries can be attributed to improper lifting technique, overexertion, and repetitive motions. The Mechanical Arm Support System, or M.A.S.S., was originally intended to alleviate these problems.

The concept of the M.A.S.S involves making a tool balancer, a device that suspends a tool or object for a user. This device is mobile and instantly ready to use. The tool balancer is placed overhead, and the connected tool or object will feel light or weightless due to the redistribution of its weight. Tool balancers have been used for decades, and are capable of supporting a wide range of weight, depending on the type of tool balancer being used.

The M.A.S.S. uses an innovative framework that transfers the weight of the object from the arms of the user to an area closer to the lower core, where muscles are stronger and more suited for lifting. It can be worn inside a backpack, and will help enforce proper lifting form, prevent injuries from occurring, and allow a user to take advantage of the versatility that comes with having a tool balancer above the head. The number of uses that the M.A.S.S. can offer are endless.
Abstract:
It is the endeavor of this project to use visual storytelling techniques to convey a narrative by using three dimensional computer animation methodologies and technologies. This is accomplished by using the Autodesk Maya software package and the standard film-development pipeline.
Mobile Spray Painting (MSP)
Department: Computer Science
Project Participant: Mikhak Misaghian
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
Spray painting has been used since the early 1900s, and is now a popular and convenient way of painting. Mobile devices also have become very common. Why not combine both? With Mobile Spray Painting App (MSP), we have achieved that.

The goal of the Mobile Spray Painting App (MSP) is to simulate spray painting using just your mobile device on a virtual 3D object. Using the mobile device’s camera, MSP will detect if it sees a ‘marker’ on the scene. If it does, it places the virtual 3D object on that ‘marker’, and the user then is free to paint that virtual 3D object just by touching the screen.

MSP has three use cases:

1. As a game, with which users can create graffiti art.
2. As a full-blown spray-paint simulator, with which users can practice precision spray painting; the MSP determines which spots have too much or too little paint.
3. For use in advertising. Let us say that a paint company can add a ‘marker’ to their spray cans; the user can use MSP to test that paint color on a virtual 3D object.
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 9:45 a.m.
9th Island Wave Pool
Department: Civil Engineering
Project Team: 9th Island Wave Pool Team
Project Participants: Gregory Friesmuth, Erick Mata, Daniel Miller, Juan Carlo Pascua
Instructor: Dr. David Ashley
Faculty Advisor: Dr. Sajjad Ahmad
Technical Advisors: Dr. Daniel Gerrity, Dr. Nader Ghafoori, Dr. Moses Karakouzian, Dr. Pramen Shrestha,

Abstract:
Las Vegas is known as the “9th Island of Hawaii” due to its regular stream of Hawaiian tourists. Hawaii and Vegas are premier tourist destinations in that each provide an experience that cannot be duplicated anywhere in the world. The allure of the Island in the Desert continues to tempt millions each year to venture to the Strip. However, there is one thing missing that all islands share: the surf.

An opportunity for world-class entertainment presents itself to Vegas with the proposed construction of a surfable, barreling, circular wave pool. The experience of surfing can be recreated in a safe, perfectly controlled, and potentially endless ride. The experience of surfing is difficult to describe, but hard to forget – too few beachgoers ever get the chance to take the plunge.

The 9th Island Wave Pool removes the barriers of a real island vacation—high cost, long travel time and distance, and great white sharks. It facilitates the unforgettable joy of surfing for both the very young and the old, who may not have the strength to swim into the roughest ocean conditions. Utilizing precision hydrofoils, rail acceleration, and unique geometric design of the retaining walls and floors, the 9th Island Wave Pool aims to provide a two-meter-tall surfing wave that can vary in size and power. The circular Wave Pool also is designed for a minimal electrical energy requirement, proving its sustainability and marketability to operating companies. The 9th Island Wave Pool: sustainable, commercially marketable, and entirely unforgettable.
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 10:15 a.m.
Water Bender: The Automatic Pool Filter Cleaner
Department: Mechanical Engineering
Project Team: HydroTech
Project Participants: Michael Baird, Shelby E. Nelson, Praveen Raj
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Yitung Chen

Abstract:
There are more than 12 million pools in the United States alone. As part of the maintenance of each pool, there are filters that the owner must clean. Currently, pool owners have to clean their pool filters by hand. This is messy and wasteful, resulting in approximately 10 billion gallons of water being used per year on cleaning pool filters in backyards across America. Bending over and kneeling down to clean each filter also is very laborious, and causes the pool owner back and knee pain.

The goal of our senior design project is to design a user friendly, affordable device that will adequately clean pool filters while saving water. We call this device the Water Bender: The Automatic Pool Filter Cleaner. The pool owner connects this device to a standard garden hose, attaches the filter on the roller axle, and opens the spray valve. The Water Bender uses high-pressure jets of water to remove dirt from each fold while simultaneously rotating it to ensure that there is no need for human effort at all. The filter is placed on a roller axle with bristles to hold it in place. The roller axle is then placed upon adjustable height stands. A spray bar assembly with staggered spray jets is placed over the filter and stand assembly.

Just connect the hose to the spray pipe, and let the Water Bender do the dirty work! Our design saves time and effort, not to mention, water.
Femoral Implant Rod

Department: Mechanical Engineering

Project Team: RHO

Project Participants: Jessica Hartman, Katelyn Orr, Kyle Rebman

Instructor: Dr. Zhiyong Wang

Faculty Advisor: Dr. Mohamed Trabia

Community Advisor: Dr. Yehia Marreez

Abstract:
The goal of this project is to improve the surgical procedure used to align long bones in the body after a fracture occurs to promote good healing.

Our design for a femoral rod implant changed the order of the surgical procedure by first drilling our modified screws into the bone; then sliding the titanium femoral rod over the screws. The screws are then fixed on the outside of the bone to keep the rod from twisting. By changing the order of the procedure, the length of the surgery could be shortened, because the accuracy is improved. This is done by not needing continuous x-ray exposure when aligning the screws in the rod. In addition, this design provides a slot that does not require the same accuracy as previous designs.

This design provides benefit both to the patient, as well as the surgeon, by limiting the x-ray exposure, which can have harmful side effects. This design has similar functions to the currently available implants, with the added benefits of greater accuracy and a shortened procedure.
Abstract:
P2Lnow.com builds on an idea from Memrise.com idea to assist learning with virtual flash cards and multiple-choice tests; it is just as fun as playing a game. However, instead of just choosing the right words from a menu, the games are more similar to regular action video games, and therefore even more engaging. Try them yourself - play to learn now!
Energy Harvesting Wireless Sensors

Department: Electrical and Computer Engineering

Project Team: Energy Harvesters

Project Participants: Sean Crippen, Eduardo Olivares, Yelthin Orochena, Angusman Roy

Instructor: Dr. Ke-Xun Sun

Abstract:
The future is data driven. Revolutions are taking place in diverse applications due to the ability to process and glean meaningful information from vast amounts of data. Resolving many future challenges, such as climate change, depends on large sets of data. However, the benefits of advanced information processing cannot be realized without effective data collection.

Ultimately, all data from the natural world is obtained initially from a sensor, which converts natural phenomena – such as light, vibration or temperature – into numbers that can be measured and analyzed. In order to ensure accurate data collection, a large number of sensors over the entire area of interest need to be deployed. This presents a challenge in the form of power requirements. Remote electronic sensors need to be electrically powered, and this has been traditionally been done with a battery.

In order to remove maintenance requirements of remote sensors, energy-harvesting circuitry has been developed. These circuits can extract very small quantities of energy from such natural sources as sunlight, heat, and galvanic potentials. This energy is stored in ‘super capacitors’, and is used to power a microcontroller, sensors and a transmitter. The data obtained from the sensors is transmitted wirelessly to a computer, from which the user can view, process, and interpret the data.
Abstract:
The DesertSol Structural Group has developed a structural package for an architecturally unique, solar-powered modular home that is scheduled for construction beginning in January 2013. The team's objective is to deliver the analysis and design of a safe, cost efficient, and sustainable structural system for the 2013 US Department of Energy/NREL Solar Decathlon.

The structural package entails construction plans, detailed design spreadsheets, and computer software analysis. The design utilizes “advanced framing” techniques combined with the use of environmentally friendly materials, and effectively contributes to the sustainability, energy efficiency, and ultimately the accreditation of the home by the Leadership in Energy and Environmental Design (LEED) program of the U.S. Green Building Council.

The nature of the Solar Decathlon competition requires a thorough exploration of available framing, lateral force resistance, and temporary foundation systems, as well as close coordination with architects and fellow engineers to fulfill the architectural, sustainability, and energy goals of the project. Additionally, the design accommodates:

1. The necessity of the home to be completely disassembled, transported, and reassembled on multiple occasions; and
2. The behavior of the home under transport and stationary loading due to the concept's inherently irregular geometry.

The structural team has worked closely with material suppliers, professional structural engineers, modular home manufacturers, and transportation companies to design a frame capable of withstanding all gravity-related dead and live loads, 90 mph winds, and seismic zone D requirements, which is the second most stringent. The completed design will be stamped by a California-licensed structural engineer, and will fully satisfy modular home permit standards from a modular home manufacturer.

PHOTOS ON PAGE 22
Photos for 2013 Solar Decathlon Structural Design

BIM model of UNLV DesertSol Solar Decathlon 2013 house

DessertSol Structural Design Group
Left to right: Ankush Sehdev, Iani Batilov, Joanna Ayson, Russell McLellan
CityScape is a procedural city scape generator. The program will randomize the location of skyscrapers and other buildings in a way that is different every time the program is run, but still organized in a way that it looks like a convincing city. Planes, helicopters, and roads with cars are included in the program, some of which have home locations, such as airports and police stations, where they make periodic stops. Lighting and other effects are used to make the output aesthetically pleasing.
**Time:** 11:35 a.m.

**Project KIDS (Kids Intellectual Development Shooter)**

**Department:** Computer Science

**Project Participant:** Antonio Mena

**Instructor:** Dr. Evangelos Yfantis

**Faculty Advisor:** Dr. Evangelos Yfantis

**Abstract:**
This project is an educational “shooter” meant to aid young children in basic elementary processes, such as recognizing numbers, shapes, and colors. The core of the program is rotating a launcher to aim at a proper can-shaped target and fire; this will grant access to various games. If the player is already inside one of the games, the program registers the can hit and calculates if the correct target was hit. In addition, to give a greater sense of interactivity, the whole program is voiced, and gives feedback based on what happened after the launcher was fired.
**Sock Assist**

**Department:** Mechanical Engineering  
**Project Team:** Group Sock Assist  
**Project Participants:** Mike Arview, Wareh Farass, Caleb Maher, Sammy Zaidi  
**Instructor:** Dr. Zhiyong Wang  
**Faculty Advisor:** Terry Kell

**Abstract:**

Millions of people around the world suffer from debilitating diseases and injuries that can make the simplest of things, such as putting on your own socks, difficult. Our project is an automated sock donning machine that will allow a user to don their socks independently with little input required. The current market does not provide a machine that can do this without a fair deal of movement from the user.

Our group simulated the sock donning process using spring scales in a path defined by an analysis of two feet of different sizes. After analyzing the two different size feet, we found a stronger correlation to the bottom of the foot. Also, we found the heel to be the most difficult part of this process.

Our sock donning machine is designed to work by using a two chain system with a sandal-like applicator that the sock is fit over and pulled onto the user’s foot; it focuses on getting the sock past the heel of the user’s foot. This machine will allow those who are restrained by injuries or disease the freedom to perform a simple action that many take for granted.
Interact with Kinect
Department: Computer Science
Project Team: Binary
Project Participants: Brian Lu, Hong Xiang
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
The idea of this project is to remotely control a robot to follow a path drawn by the user's hand movement. We got the idea from playing a popular real-time strategy game called StarCraft, where the player commands combat units from a top-down view to move around the map and fight units of the other player. We wanted to create a system that simulates this idea in the real world.

In this game, the player will be able to see a video stream from a camera shooting down from the top of the robot on a TV. We used a Kinect sensor from the Xbox360 gaming console to track the player’s hand movement in front of a display to create a path for the robot to follow.

Image processing is heavily involved in this project. The camera on top of the robot is used to recognize the robot and its position. The positional data then is processed by the computer to guide the robot.

We think this project has a wide range of practical applications. For example, with this technology, a soldier can just use their hands to control unmanned vehicles during combat. Moreover, the top-down view enables to soldier to control units in an intuitive way.
Kinetic Energy Regenerative Braking

Department: Mechanical Engineering

Project Team: KERB

Project Participants: Enrique Gonzalez, Kyle Litton, Daniel Silva, Jose Triay

Instructor: Dr. Zhiyong Wang

Faculty Advisor: Dr. Georg Mauer

Technical Advisor: Dr. Yi-Tung Chen

Abstract:

Every day, precious energy is wasted when a vehicle uses its friction brakes to convert its kinetic energy into unrecoverable thermal energy in order to slow down. The EPA rates an automobile's fuel economy separately for city and highway driving, because the stop-and-go nature of city driving has a significant impact on fuel economy. For example, the 2012 Toyota Camry gets 25 mpg city and 35 mpg highway – or 40% better economy on the highway – without wasteful friction braking.

Kinetic Energy Regenerative Braking (KERB) aims to bridge the gap between stop-and-go fuel economy and steady highway fuel economy by converting potentially wasted kinetic energy into a storable and retrievable form of energy. KERB is coupled to a vehicle’s drivetrain, which spins a pump/motor in order to pressurize fluid into a hydraulic accumulator. This converts kinetic energy into storable potential energy, which slows the vehicle down. Once acceleration of the vehicle is required, the process is reversed and the vehicle recovers kinetic energy. A hydraulic circuit and electrical control system is used to obtain smooth, variable, and user-defined acceleration and braking.
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 1:30 p.m.
Three-Dimensional Scanner
Department: Electrical and Computer Engineering
Project Team: 3D EleMnt
Project Participants: Morris Ben-Aouicha, Chequala Fuller, Sung-Jae Oh, Christian Vega
Instructor: Dr. Ke-Xun Sun
Faculty Advisor: Dr. Venkatesan Muthukumar

Abstract:
3D Scanning is used to analyze the ‘as-built’ condition of parts after they already have been manufactured. Systematically, non-contact technology is used to swiftly inspect the overall form and scope of parts, quickly detecting such issues as early-stage deformity and overall scale issues. 3D scanning is used in combination with mapping and statistical analysis software to preserve and visualize quality in manufacturing processes.

The 3D EleMnt three-dimensional scanner has the capability to recreate models of a contour by way of mapping coordinates. It uses analog infrared sensors positioned both vertically-faced and horizontally-faced while being retracted by the piston of a linear actuator. The scanner also has the capability to provide details of any deformities present on the surface of the model.

This scanner can serve the purpose of early stage detection of unwanted warping within an object or recreate the contour of an object to optimize its scope and/or fitting.
Abstract:
As part of the 2012 Master Plan, the University of Nevada Las Vegas has requested the services of the Nex Gen team to design and estimate a budget for a ‘Next Generation’ urban parking garage. As part of this project, the university has requested some special considerations, as follows:

- Commercial space on the first floor,
- 1,000 - 1,500 parking spaces,
- Energy efficiency, and
- Cooperation with the previously designed bus depot by the Regional Transportation Commission (RTC).

At the same time, the university has requested an aesthetically appealing structure to students, pedestrians, and motorists.

Nex Gen set the standards to an even higher level while focusing efforts on providing the most functional ramps possible, designing an atrium/courtyard, solar power possibilities, and pre-cast construction methods for opening doors. Additionally, Nex Gen focused on cooperating with RTC, while meeting and exceeding the university’s design parameters.

Several ideas were considered and evaluated during design for the Nex Gen parking garage, from fly-over ramps providing direct access in and out of the parking garage to a full-length atrium in the middle of the parking garage. All ideas were evaluated on premise of feasibility, affordability, and sustainability. So, if you wonder what features are found in a Next Generation urban parking garage, please stop by and find out what may be in store.

PHOTOS ON PAGE 30
Photos for UNLV Parking Garage
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 2:00 p.m.

Carnival Game
Department: Computer Science
Project Participant: Daniel Cauley
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
Carnival Game is a computer game that tasks players with playing up to three different carnival games. These games are:

- Ski Ball: The Midway classic, where players are expected to roll balls up an inclined plane and, hopefully, launch them into holes of varying point value.
- Ball Toss: Another classic carnival game, in which players are expected to throw balls to knock down a group of precariously stacked milk bottles.
- Balloon Pop: In this game, the player is presented a wall of balloons and up to three darts. The player’s goal is to pop as many balloons as possible with the darts.

These games will be presented to the player in an open world environment. That is, players will walk around the carnival to the various tents and play the games in a seamless manner.

Completion of these various games will reward the player with tickets. Once a requisite number of tickets has been earned, the player may go to the “circus,” which consists of a non-interactive graphics demo.
Smart Phone Augmented Reality Puzzle Platformer

Department: Computer Science
Project Team: 8 Bit Bow Tie
Project Participant: Raymond Imber
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
As smart phones have improved in hardware capabilities and camera quality, there is an increasing amount of research in the area of Augmented Reality. Augmented Reality renders live video from the device camera onto the device display. Virtual 3D objects are then superimposed on the live camera preview, and appear to be tightly coupled with the real world.

The goal of this project is to use commodity hardware and an openly available computer vision framework to create an interactive Augmented Reality game. The project consists of an Android smart phone and a printed card with a high-contrast image. The card is used to calibrate the virtual 3D space to the image.

The game consists of small virtual creatures that appear on top of the printed card. The player must interact with the creatures to safely guide them through an environment projected onto the physical scene.
Citric Pulpinator

Abstract:
As the use of the kitchen has changed, the technology that is available has adapted to meet the needs of a homeowner. Specifically, household appliances have come a long way in recent years. The Citric Pulpinator is a fully automated device focused on efficiency in time and quality. Today, similar devices fail to extract the juice of a fruit that is enriched with vitamin C due to the appliances’ small range of sizes that they can process. Devices that do accommodate different fruit diameters compromise the quality and flavor of the juice extracted.

The Pulpinator is intended to cut and squeeze citrus fruits of various dimensions, such as lemons, limes, oranges, mandarins and grapefruits. This design extends the range of the sizes that can be utilized at once. There are many different machines that execute a single function, but this device is multifunctional. The design was based on the ability to extract the juice of a citrus fruit by a fully automated module and/or cut open for immediate consumption.

Due to the complexity of The Citric Pulpinator, off-the-shelf mechanical and electronic components that can be easily acquired were used. Engineering principles were applied to orchestrate these components for them to function properly. Due to hazardous moving parts, safety was taken into account. This design was carefully chosen to successfully compete with other citrus devices.
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 2:35 p.m.
Diamond Heat Spreader
Department: Mechanical Engineering
Project Team: Team Dragin
Project Participants: Haleema Awan, Stephanie Chagin, Nathaniel Ross
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Yi-Tung Chen

Abstract:
The objective of the diamond heat spreader is to build a heat sink for the central processing unit (CPU) of a laptop. The heat sink will allow the CPU to dissipate heat quicker than usual due to the presence of diamond in the heat sink. Diamond has three times the heat transfer capabilities of copper. With the increase in heat transfer that the heat sink provides, smaller fans can be used for cooling the CPU, resulting in lower power consumption.

While the concept of using diamond to dissipate heat is not new, our process creates effective diamond heat sinks at a much lower cost than prior processes. Our design uses a brass mold that doesn't bond with our solder; as a result, the heat sinks can be fabricated that can be easily removed. For this design, multiple heat sinks with varying compositions of solder were built and tested to determine the best and most economical composition of diamond and solder.
AudioVis is a 3D audio visualization program that projects sound data across 3D space, and allows the user to control various facets of the visualization. Users will be able to morph the visualization with various shapes and analyze the waveform loaded in. The sound is fed in from a .wav audio file and displayed dynamically; it is further mapped to a mesh, which the user can customize in a variety of ways. Play control allows the audio to be paused so the waveform can be analyzed.
Abstract:
The purpose of this project is to create an interactive computer-generated environment for people to enhance their problem-solving abilities by solving logical puzzles while traversing a maze.

This maze was created in a three-dimensional world, generated by using the OpenGL Application Programming Interface in the C++ programming language.
Senior Design Project Abstracts  
Foundations Building, Blasco Event Wing  
December 5, 2012  

Time: 3:40 p.m.  
High Efficiency Power Supply  
Department: Electrical and Computer Engineering  
Project Participant: Anh Bui  
Instructor: Dr. Ke-Xun Sun  
Faculty Advisor: Dr. Ke-Xun Sun

Abstract:  
Silicon is an important semiconductor that is used in many innovative and modern electronic devices today. However, silicon components suffer from a low-band gap, which makes them very sensitive to fluctuations in temperature. Silicon carbide (SiC), on the other hand, has a much larger band gap; as a result, it is far more stable at high temperatures. Moreover, SiC has high thermal conductivity, so an increase in temperature does not degrade the device’s switching parameters.

Recently, metal oxide semiconductor field-effect transistors (MOSFETs) made of silicon carbide have become commercially available. These are more beneficial to utilize than silicon MOSFETs in high-power applications, such as switch-mode power supplies. Replacing the silicon switch to a silicon carbide switch in a power supply makes the on-resistance of the switch more stable with respect to temperature and reduces switching losses. As a result, the device as a whole becomes more efficient and stable.
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 3:50 p.m.
AliVe: Mars
Department: Computer Science
Project Participant: Jan Espejo
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
Recently, NASA’s Curiosity rover landed on Mars. This Senior Design project – Project AliVe: Mars – is a 3D animation based on that amazing robot. As it explores the surface, in this animation, when the rover comes upon an object, such as a rock, it examines the rock and discovers something big.

However, the rover isn’t the only focus of this project. There’s a nice blue dog that goes by the name of Daker. Within his virtual box, he’ll be the host of the show, and present the project to all of you.

Mars’ landscape is randomly generated, and the rover must figure out how to navigate it. No matter how bumpy the road is, this rover makes it to its goal. But what happens after? And why is this called AliVe: Mars? Well, you’ll have to see and find out.

The rover’s model was made purely in code by using OpenGL. The textures were hand drawn in Adobe Photoshop, using a tablet. No pre-made assets were used, only custom detailed parts. If you look closely, you can see Jet Propulsion Laboratory (JPL) in Morse code on the wheels. The animated rover is composed of many individual components, all of which come together to convey the idea of a complex machine.

This project was the product of one semester’s work, with no prior experience in 3D graphics, but with lots of ideas and experimenting. Hopefully, this 3D experience will pique your curiosity.
Senior Design Project Abstracts
Foundations Building, Blasco Event Wing
December 5, 2012

Time: 4:00 p.m.
Maya Character Rig Generator
Department: Computer Science
Project Participant: Julian Owyong
Instructor: Dr. Evangelos Yfantis
Faculty Advisor: Dr. Evangelos Yfantis

Abstract:
Autodesk Maya is standard software in the film and videogame industry that enables users to model, rig, and animate characters. The underlying code, written in the languages Python and MEL, allow programmers to access the software’s capabilities and optimize production. Creating these ‘tools’ for use by artists and others throughout the production pipeline increases productivity, streamlines the production workflow as well as reduces the overall bottom line. Rigging a model to prepare it for animation is one such process that, when automated, saves the rigger and/or animator much needed time and resources.

Building a joint system for use in animation consists mainly of two types: Forward Kinematics and Inverse Kinematics (FK/IK). These differ in such a way that the resulting orientation of the body part is calculated. For a bipedal character, controlling the numerous joints, providing flexibility with regards to squashing and stretching, as well as providing options to manipulate other body parts, such as the neck, waist, and head, would have to be taken into account when producing a useful/dynamic rigging tool through scripting.
Title: Electronic Sway Bar Disconnect
Department: Mechanical Engineering
Project Team: Team Sway
Project Participants: Scott Cacal, Jonathan Poblete, Jacob Woolman
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Hui Zhao

Abstract:
All-terrain utility vehicles (more specifically, side by sides) are known for their practical use among outdoor enthusiasts. Yamaha Rhinos are among the top sellers in the line of side by sides. The Rhino is capable of virtually any task an outdoorsman needs to accomplish, from traversing along rugged terrain to hauling large and heavy loads.

An integral part to the driving behavior of the vehicle is directly related to the vehicle’s sway bar mechanism (Figure 1, at right). The sway bar controls the articulation of the rear suspension.

There are preferential differences between utilizing the sway bar compared to fully disconnecting it from the vehicle. A sway bar also is referred to as an anti-roll bar because it is designed purposely to help prevent the vehicle from rolling while maneuvering around corners. An inconvenience associated with the current sway bar mechanisms is that the user must manually disengage the sway bar by physically detaching it from underneath the vehicle. This is a concern that has been expressed on numerous occasions by users for quite some time. Detaching the sway bar would allow rear suspension freedom to react better to rougher terrain.

Our design is an improvement to the way users decide which suspension settings they prefer by giving them the power to choose from the driver’s seat (Figure 2, at right). Instead of having to perform a tedious operation, our design will automatically connect/disconnect the sway bar by the flip of a switch.
Figure 1: stock sway bar

Figure 2: redesigned sway bar

Team Sway
Left to right: Scott Cacal, Jonathan Poblete, Jacob Woolman
Abstract:
The Las Vegas area faces a serious challenge in meeting the water demands of a growing population. Compounding this issue is the seemingly endless drought plaguing the Colorado Basin area. The Southern Nevada Water Authority has implemented programs geared at reducing the water demand by means of conservation and landscape conversion rebates, as well some watering restrictions.

Water recycling is gaining some serious consideration. Water used for showers, hand sinks, and clothing washers can be recycled and used for toilet water and landscaping. Our team, MJR Consultants, has analyzed the water usage for the University of Nevada, Las Vegas, and has found a potential for implementing a grey-water system that can be used to irrigate landscaping or for toilet flushing. We have designed two potential grey-water treatment and distribution systems to use on the campus, and have also compared the cost of implementation, operation, and maintenance of these systems. The water saving potential of each of these systems also has been evaluated.
Motorized TV Wall Mount

Department: Mechanical Engineering
Project Team: MTV Wall Mount
Project Participants: David Fyda, Ryan Ghanaatrad, Jorge Pulido
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Mohamed Trabia

Abstract:
Flat screens are getting more and more popular every year, along with homes with open-floor plans. The majority of wall mounts need to be adjusted manually and locked in place. This creates a little bit of inconvenience for the user any time they decide to do something in an adjacent room, such as the kitchen, for example, if it were open to the living room.

Our idea was to create a motorized TV wall mount that uses two motors and a simple remote control. The back motor controls the distance that the TV is located from the wall in order to create room for rotation without the sides of the TV coming in contact with the wall. The front motor controls the actual left or right rotation. Simultaneously, the TV extends from the wall while rotating. The remote sends signals to an arduino board, which simply tells the motors which way to rotate, depending on which button is pressed, left or right.

Simplicity is key to this design. If this assembly can be done with reasonable cost, then we believe this would be extremely successful in the current market of TV wall mounts. People love their TVs, and are willing to spend hundreds on wall mounts; the larger the TV, the more expensive the mount. The application is not limited to residential use, either. It could have a great deal of success in businesses, such as bars and pool halls, where the TVs are mounted high and are inconvenient to adjust.
Mobile Utility Cart
Department: Mechanical Engineering
Project Team: MUC
Project Participants: Keith Cooper, Dallas Jaeger, Devin Jones
Instructor: Dr. Zhiyong Wang
Faculty Advisor: Dr. Brendan O’Toole

Abstract:
MUC (Mobile Utility Cart) is the culmination of an engineering design project undertaken by three undergraduate Mechanical Engineering students at the University of Nevada, Las Vegas (UNLV) throughout the 2012 spring and fall semesters.

The goal of the MUC project is to design and produce a motorized utility cart that can conveniently transport and provide support for a robot and 250 lbs. of related equipment during a FIRST Robotics high school competition by a team that is overseen by our mentor, Dr. O’Toole. This design was provided at a relatively low production cost, due to in-house fabrication. The MUC provided optimal strength, convenience, and mobility to Area 52 Robotics during the competitions.

The need for mobility was taken into consideration, with the use of a full working suspension, electric motors, and remote operation. Each part was designed, machined, programmed, and assembled by the MUC team in the interest of utility and style.
Thank you, fall 2012 Senior Design instructors!

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Department of Computer Science
   Dr. Evangelos Yfantis

Department of Electrical and Computer Engineering
   Dr. Ke-Xun Sun

Department of Mechanical Engineering
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