Celebrate the spirit of entrepreneurship...

Fall 2008
Senior Design Competition

The Howard R. Hughes College of Engineering

December 3, 2008

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

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. A capstone to the student's educational career, the senior design project encourages the student to use everything learned in the engineering program to create a practical, real world solution to an engineering challenge.

The senior design competition helps to focus the senior students in increasing the quality and potential for commercial application for their design projects. Judges from local industry evaluate the projects on innovation, commercial potential and presentation quality. One overall winner two winners from each discipline and one multi-disciplinary winner, two winners from each discipline, and one multi disciplinary winner (when applicable) are chosen and receive cash awards and commemorative plaques and medallions.

The competition has generated significant interest from the local community, and has provided additional motivation for students to be innovative and to produce quality projects.

History

In 1999, the Entrepreneurship Club (E-Club) of the College of Engineering began sponsoring the Senior Design presentation event. The E-Club has been actively pursuing the goal of integrating entrepreneurship with engineering curriculum through seminars and facilitating senior design projects. In 2001, the E-Club conducted its first senior design competition. This opened the senior design event to Civil and Environmental, Electrical and Computer, and Mechanical Engineering students. The E-Club itself, the senior design projects and the competition all encourage students to become entrepreneurs upon graduation and contribute to the College's role in the economic diversification of the Southern Nevada area.

The Awards

Beginning in 2002, College of Engineering supporters Harriet and Fred Cox have generously provided for the Harriet and Fred Cox Engineering Design Award to be given to the top outstanding projects in the senior design competition. Ongoing support for the awards has been established by their endowment gift to the College. The founder of four corporations — Emulex Corporation, Manufacturers Capital, California Data Processors, and Microdata Corporation — Fred Cox knows the value of entrepreneurship very well, and he and his wife Harriet are delighted to support the College of Engineering and our students in this significant venture. A special dinner in the spring celebrates the students' achievements and provides their families faculty and the greater Las Vegas community an provides their families, faculty, and the greater Las Vegas community an opportunity to share in the excitement of the students' work.

Senior Design Instructors

Dr. Jaci Batista
Department of Civil & Environmental Engineering
Dr. Paolo Ginobbi
Department of Electrical & Computer Engineering
Dr. Brian Landsberger
Department of Mechanical Engineering
Dr. Barbara Luke
Department of Civil & Environmental Engineering
Dr. Edward Neumann
Department of Civil & Environmental Engineering
Dr. Walter Vodrazka
Department of Civil & Environmental Engineering
Dr. John Wang
Department of Mechanical Engineering

E-Club Faculty Members:
Dr. Laxmi Gewali
Dr. Henry Selvaraj
Dr. Rama Venkat
Dr. John Wang

Judges

A Special Thank you to our
Senior Design Industry Judges:

Lisa Freestone, '94, P.E.
Carollo Engineers

Tim Lockett
Assistant Director of Construction & Planning & Construction Services, UNLV

Charles W. Scott, P.E.
Las Vegas Valley Water District

Presentation

Presentation Slot	Presentation Time	Senior Design Pr
Slot 1	9:00 A.M. - 9:30 A.M.	Soda Vending Ma
Slot 2	9:15 A.M. - 9:45 A.M.	Shhhop Vac
Slot 3	9:30 A.M. - 10:00 A.M.	open
Slot 4	9:45 A.M. - 10:15 A.M.	Telephone Encry
Slot 5	10:00 A.M. - 10:30 A.M.	LEED ND Comm
Slot 6	10:15 A.M. - 10:45 A.M.	FaxMan Fax Serv
Slot 7	10:30 A.M. - 11:00 A.M.	Open
Slot 8	10:45 A.M. - 11:15 A.M.	Best Lug Nut Re
Slot 9	11:00 A.M. - 11:30 A.M.	Ergonomic Lapto
Slot 10	11:15 A.M. - 11:45 A.M.	Easy Branch Pru
Slot 11	11:30 A.M. - Noon	Automatic Cork
Lunch	Noon - 1:15 P.M.	LUNCH
Slot 12	1:15 P.M. - 1:45 P.M.	Pantry Inventory
Slot 13	1:30 P.M. - 2:00 P.M.	Ambulance Alert
Slot 14	1:45 P.M. - 2:15 P.M.	open
Slot 15	2:00 P.M. - 2:30 P.M.	LED Intelligent Li
Slot 16	2:15 P.M. - 2:45 P.M.	open
Slot 17	2:30 P.M. - 3:00 P.M.	open
Slot 18	2:45 P.M. - 3:15 P.M.	open
Slot 19	3:00 P.M. - 3:30 P.M.	Headlight Aiming
Slot 20	3:15 P.M. - 3:45 P.M.	open
Slot 21	3:30 P.M. - 4:00 P.M.	open

n Schedule

Project Title	Department
Machine Inventory Monitor	Electrical & Computer Engineering
	Mechanical Engineering
cryption	Electrical & Computer Engineering
munity	Civil & Environmental Engineering
erver	Electrical & Computer Engineering
Remover	Mechanical Engineering
ptop	Mechanical Engineering
Pruner	Mechanical Engineering
k Remover	Mechanical Engineering
	LUNCH
ry System	Electrical & Computer Engineering
ert System	Electrical & Computer Engineering
t Light	Electrical & Computer Engineering
ing Improvement	Mechanical Engineering

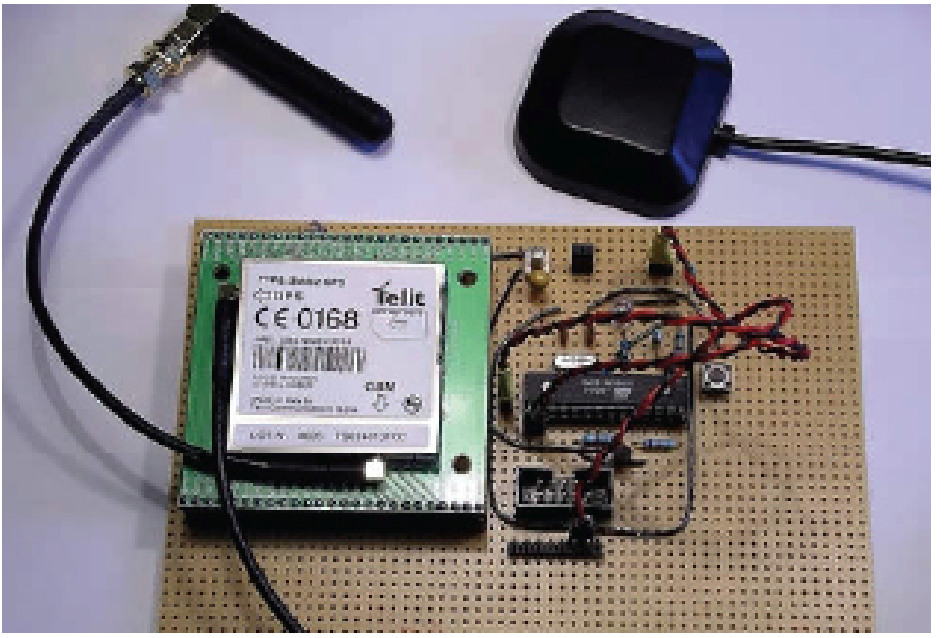
Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 9:00 – 9:30 a.m.

Title: Soda Vending Machine Inventory Monitor
Department of: Electrical & Computer Engineering
Project Participants: John Alexander and Noel Gueco
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Paolo Ginobbi

Abstract:
Our project increases vending machine restocking efficiency by allowing vending machine owners the ability to check the inventory status without making a trip to the machines' locations. With our product, a PIC microcontroller, the owner can send a text message to the machine and get an inventory status. In addition, the machine will send a text message at any time a product gets below a specified threshold. This saves time and money for the vending machine owner instead of having to make weekly trips having to make weekly trips.

Our design layout will monitor the product selection buttons so when they are pressed it will then observe the chute sensor to verify that a product has been dispensed. If the microcontroller determines that the product has been dispensed, then it will then deduct from the appropriate product count. At any point that the product count gets below the determined threshold it will send a warning message to the phone number entered in the stored memory. When the machine is being refilled the vendor will be responsible for changing the count of each product in the module's memory, which is accessible via a LCD menu.


CE 0168
Telit
GSM

Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 9:15 – 9:45 a.m.

Title: Shhhop Vac
Department of: Mechanical Engineering
Project Participants: Brandon Bechtol and Juan Plata
Instructor: Dr. John Wang
Faculty Adviser: Dr. Brian Landsberger

Abstract:
Shop vacuum customers are complaining about the current sound levels of their products, including their "quiet" vacuums. They are willing to pay up to three times the price of the lower priced shop vacuums to avoid the harmful noise levels. The purpose of the "Shhhop Vac" project is to create a method for reducing the sound level of current shop vacuums. We have improved modern wet/dry vacuums by reducing their sound level without drastically reducing their efficiency. Our product addresses critical customer complaints at a low cost.

In order to accomplish our goal we opted to cover the top part of the shop vacuum. This area was the major sound source according to our experiments. Our prototype incorporates sound absorbing material in order to passively incorporates sound absorbing material in order to passively attenuate the sound generated from the impeller. Active means of sound attenuation were implemented using Helmholtz resonating chambers. Results obtained during testing in the anechoic room indicated a significant sound reduction without a decrease in overall efficiency.

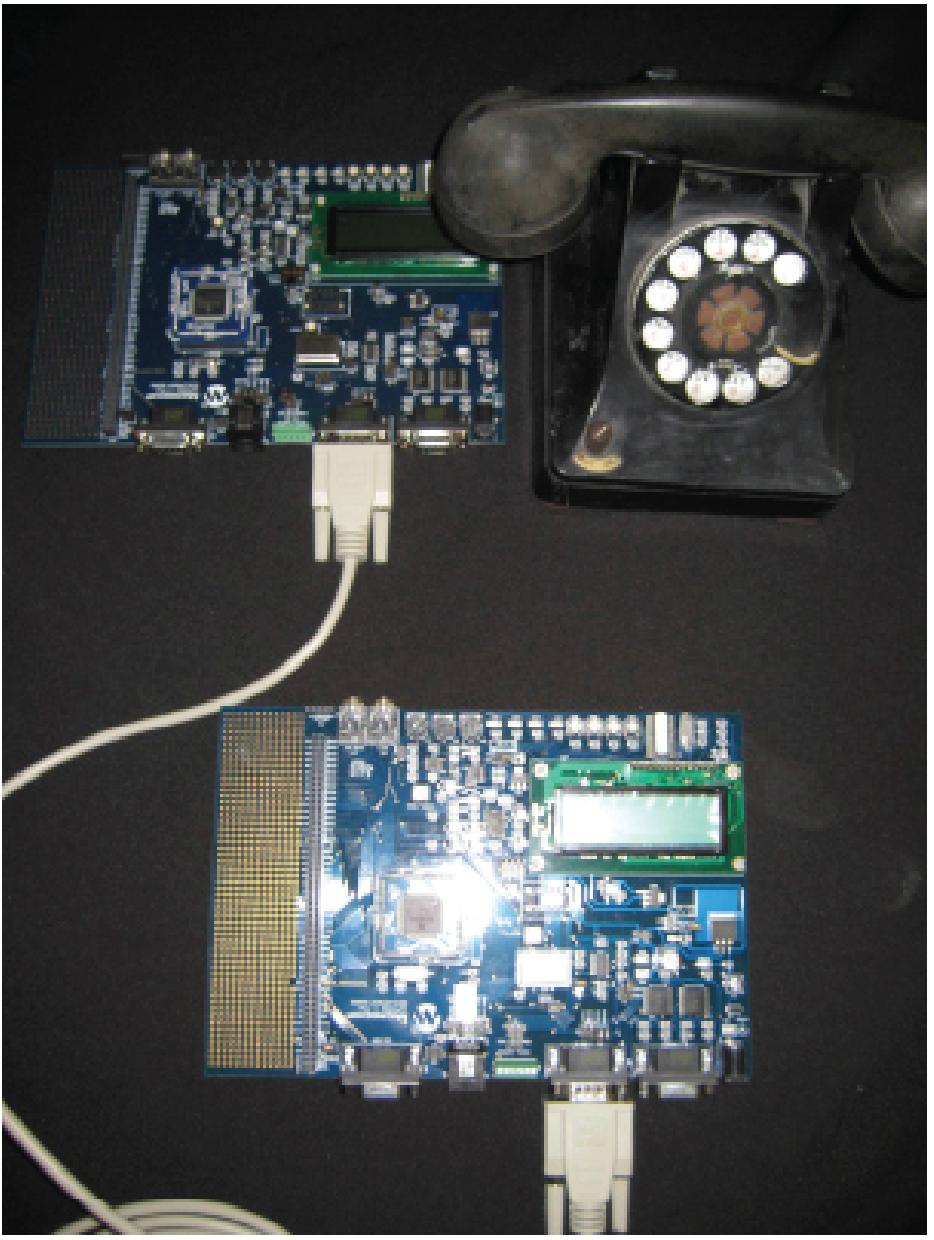

shop-vac

Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 9:45 – 10:15 a.m.

Title: Telephone Encryption
Department of: Electrical & Computer Engineering
Project Participants: Adam Seymour, Jovan Sparacino, and Raymond Yost
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Paolo Ginobbi

Abstract:
The telephone encryption project provides secure communication over public telephone lines by encrypting the entire conversation at both ends. At each side there is a device with a microcontroller for processing a voice signal and a modem for transmitting that signal securely signal and a modem for transmitting that signal securely. The voice signal goes through an analog to digital conversion process which encrypts and encodes the signal in real time. Security has become more of an issue as phone conversations flow through public networks and when privacy is essential.



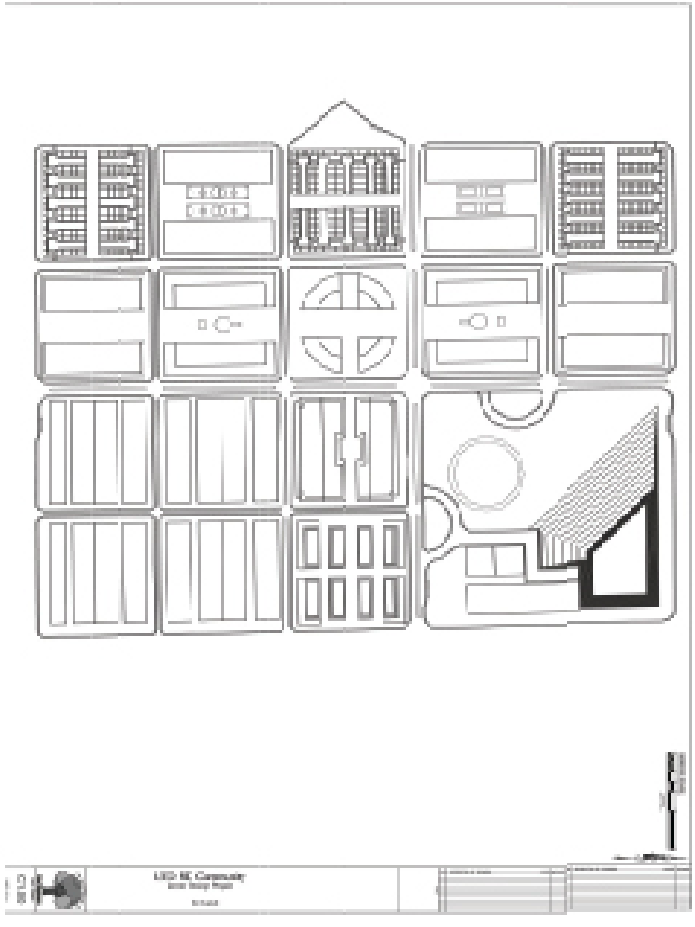
Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 10:00 – 10:30 a.m.

Title: LEED ND Community
Department of: Civil & Environmental Engineering
Project Participants: John Amato, Dustin Payne, John Petrie, and Richard Robinson
Instructor: Dr. Barbara Luke
Faculty Adviser: Dr. Hualiang "Harry" Teng
Community Mentor: Mr. Paul Villaluz '97, '06, P.E., PTOE

Abstract:
There is a growing movement among Americans to be more environmentally conscious while still having a safe and enjoyable place to live. Some residents of Las Vegas are beginning to ask if the town can continue to grow without adversely impacting the environment. They wonder if Las Vegas traffic and flooding will continue to worsen. They also question, if the town continues to grow, will people want to live and raise a family here? There is a need for a community that will fulfill such wishes.

This project begins to fulfill the need for environmentally friendly communities in Las Vegas. This start is achieved through strategic planning an it encompasses an array of civil engineering disciplines. An optimum site location was selected. The site layout fulfills the needs of the residents while minimizing environmental impact. Technical studies have been completed to assess design opportunities to improve the quality of the site for both the environment and the residents. Construction documents were created as a requirement to construct the site. The project was designed in accordance with the new LEED Neighborhood Development Rating System pilot program (LEED ND) which helped give direction on the best way to minimize environmental impact.



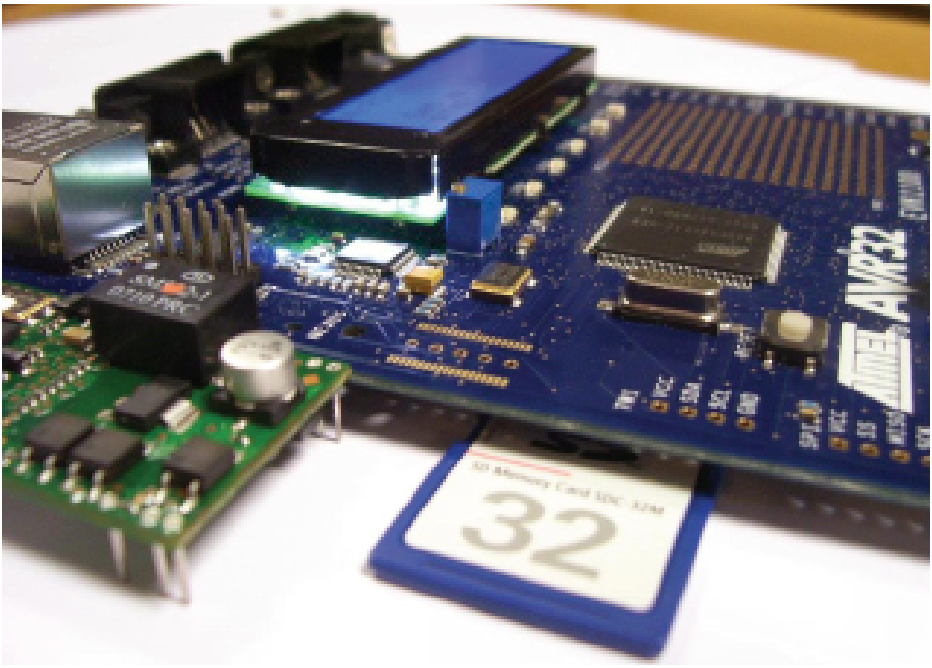
Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 10:15 – 10:45 a.m.

Title: FaxMan Fax Server
Department of: Electrical & Computer Engineering
Project Participants: Mark L. Adams, Hung Shing Lau, and Chanz Murata
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Paolo Ginobbi

Abstract:
Even in modern days, faxing is an important tool for document exchange. However, it is a very inefficient technology because it involves unnecessary repetitive work and paper waste by both the sender and receiver. A document needs to be printed by the sender, fed into his or her fax machine, and is then transmitted and printed by the receiver's fax machine is then transmitted and printed by the receiver's fax machine onto fresh paper. Paperless fax machines such as fax servers currently exist on the market, but they are very expensive and therefore not feasible for most small businesses and home offices.

The purpose of our project is to provide a streamlined and inexpensive way to both send and receive faxes. FaxMan needs only one phone line and computer network. It automatically receives and stores incoming faxes. Sending a fax is as simple as using a print command, yet does not actually use paper. FaxMan will automatically perform the fax sending, receiving, storage and organization behind the scenes. The fax files may be accessed at any time by the user interface. This results in saved paper, toner, trash, time, and money. Most importantly, the FaxMan unit is economical to produce and could sell for under $50 each.


32

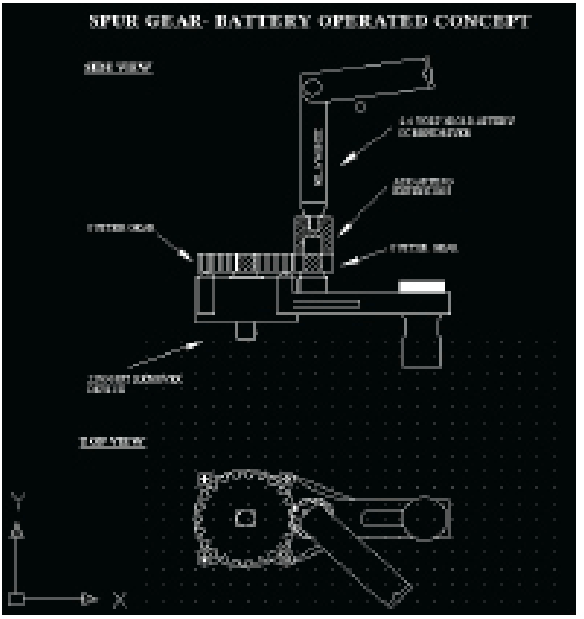
Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 10:45 – 11:15 a.m.

Title: Best Lug Nut Remover
Department of: Mechanical Engineering
Project Participants: Hector Martinez, Lino Mejia, and Ricardo Solano
Instructor: Dr. John Wang
Faculty Adviser: Dr. Brian Landsberger

Abstract:
The scope of this project entailed designing a lug nut remover that significantly reduced the amount of force required to break a lug nut free when changing a tire. Our product also incorporates safety, ergonomics and adaptability to satisfy customer needs. Several concepts have been researched and a design has been selected that satisfies the torque reduction required for application; as well as other critical functions to satisfy our customer needs.

In order to satisfy these needs the design chosen is an easy to use lug nut remover that adapts a current product with an external gearing system that will increase the torque reduction. The Best Lug Nut Remover (BLR) is safer, more ergonomic and easier to operate by all individuals. The newly designed BLR will be made of stronger and lighter materials to withstand continuous rigorous use in its final state of production. The prototype that has been constructed solely accounts for the torque reduction system. The material properties will be developed at a later time. The BLR will target all vehicle owners and automotive consumers.


SPUR GEAR- BATTERY OPERATED CONCEPT
Y
X

Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 11:00 – 11:30 a.m.

Title: The Ergonomic Laptop
Department of: Mechanical Engineering
Project Participants: Carlos Islas and Catherine Vizcarra
Instructor: Dr. John Y. Wang
Faculty Advisor: Dr. Robert Boehm

Abstract:
It should come as no surprise that laptops require accommodations to the ergonomic needs of users. However, with minimal capacity for these added benefits, only essential devices required for the common laptop functions are included in today's models. The Ergonomic Laptop Team addresses the need for a built-in device that will incline the laptop to satisfy user comfort.

This built-in feature is unique in that there are currently only wedge-shaped laptop bottoms, extended batteries, and bulky add-ons available in select models. The design will allow for an inclined laptop angle that allows for decreased user discomfort by targeting comfortable ergonomic positioning of the hands, thereby, also increasing typing efficiency. This elevating device not only makes laptop use more agreeable, but can be stored away within the laptop for practical, easy access, and convenient purposes.

The device has been challenged with conforming to the sleek design of the Apple MacBook model as the team works in alliance with the company to ensure an innovative addition to this laptop. The successful completion of this endeavor paves the way to the future of laptop designs in which including this device and function can become a common practice of the laptop manufacturing and assembly process.

Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 11:15 -11:45 a.m.

Title: Easy Branch Pruner
Department of: Mechanical Engineering
Project Participants: John Buen and Marc Lopez
Instructor: Dr. John Wang
Faculty Adviser: Dr. Brian Landsberger

Abstract:
The objective of our design process is to design an easy to use branch pruner that reduces the operating area needed to perform the cutting action. Typical branch cutting devices require the user to have an estimated 3 feet of area to perform the cutting action. This operating area is the space that a person would use between each handle from the open pruner position to the closed position. This limits the use of other branch pruners to open spaces. Our design project would allow a person to cut branches even if the 3 feet of operating area is not available.

In order to reduce the 3 feet of area, the pruner design adopted a single acting pneumatic cylinder in conjunction with the cutting head. The design utilizes a pulley to turn the push force of the pneumatic cylinder into a pull force for the cutting blade. The pneumatic cylinder uses high pressure carbon dioxide gas. Using the pneumatic cylinder not only reduces the operating area but it also reduces the amount of force the operator would need to use when cutting branches. The cutting action is performed by simply pressing a button to close the cutting blade and automatically resets to the open position when the button is released.

Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 11:30 a.m. – Noon

Title: Automatic Cork Remover
Department of: Mechanical Engineering
Project Participants: Chris Contreras, Manny Contreras, and Brianna Watson-Mayorga
Instructor: Dr. John Wang
Faculty Adviser: Dr. Daniel P. Cook

Abstract:
All wine drinkers desire the convenient ability to effortlessly open wine bottles. Uncorking wine bottles requires a large amount of force and also the awkward use of both hands. An automatic wine bottle opener is a perfect product for the wine enthusiast, as the benefits of this product would be an automated, stress-free way of opening bottles of wine. This ergonomic kitchen appliance will correctly remove the cork from the wine bottle without leaving cork residue in the wine.

Building upon the base of a sturdy mechanical wine opener that utilizes a rack and pinion to drive the corkscrew, the group is attempting to affix a motor, battery, and an accompanying electrical circuit which will replace the need for human powered electrical circuit, which will replace the need for human powered levers.

While our design incorporates an addition of a worm gear to amplify the torque from the motor, the user is also protected from the mechanism by the addition of a plastic casing. Wine enthusiasts are customers who need an easier and more convenient way to remove wine corks, making this product a desired appliance.

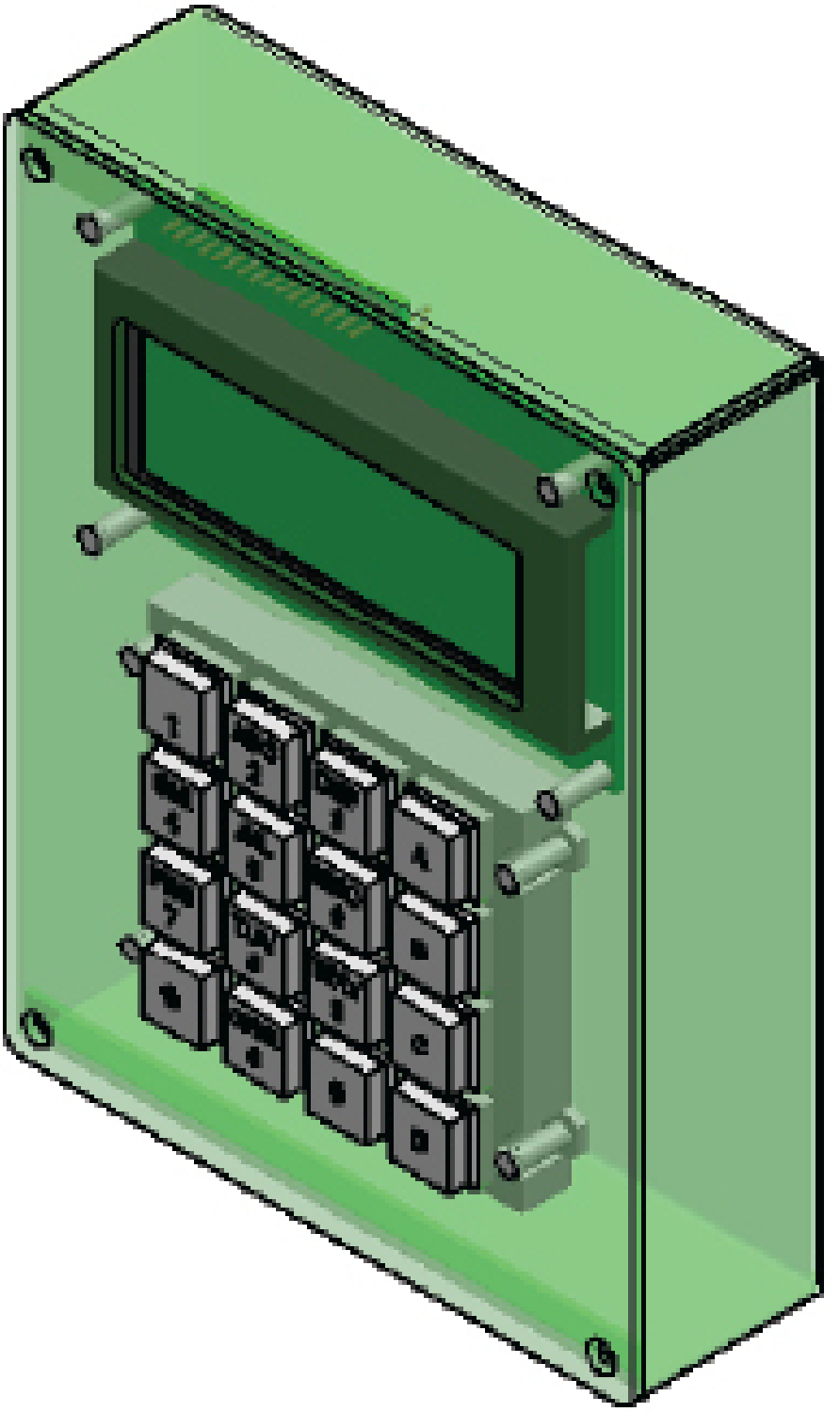
Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 1:15 – 1:45 p.m.

Title: Pantry Inventory System
Department of: Electrical & Computer Engineering
Project Participants: Fernando S. Castro and Ronald Nuval
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Paolo Ginobbi

Abstract:
The amount of items in a household pantry could range from 25 to 100 goods. When purchasing additional items at the supermarket, existing items are never taken into account. Items towards the front of the pantry are typically taken first, only to leave forgotten or outdated goods towards the back. In addition, duplication of goods are often discovered when looking for an item that a person does not have in stock. An inexpensive electronic component or pantry inventory system is needed to account for stock on hand.

Taking this idea, our team formulated and implemented a plan that would make this device a reality. By employing a USB barcode scanner to scan canned goods, an LCD display to inform users of quantities of items entered or selected, memory chips that would store the information scanned, a key pad to interface with the user, and a microcontroller to orchestrate the controls, we created the project. The purpose of this device will allow people to be informed of their pantry inventory and thus solving shortages and duplications of their household goods. Other uses included the scanning of medicines, DVD movies, and CD's. Further development of this device should allow people to be informed of their inventory by e-mail obtained through their cell phone.



Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

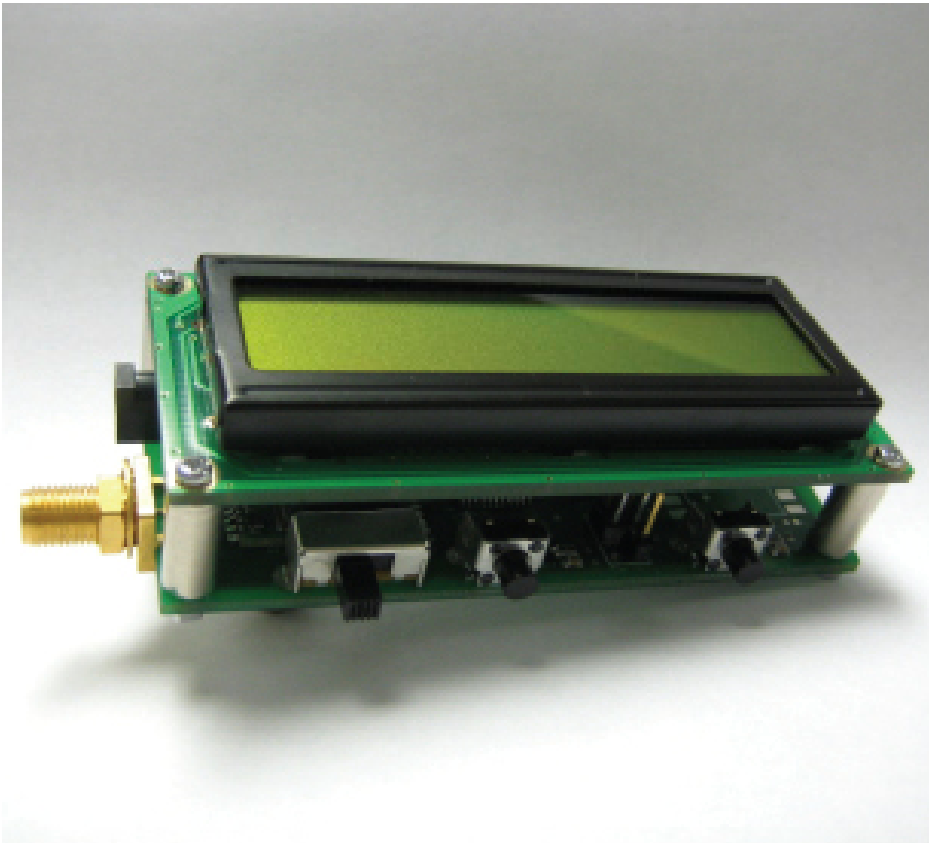
Time: 1:30 – 2:00 p.m.

Title: Ambulance Alert System
Department of: Electrical & Computer Engineering
Project Participants: Lacey D. Garcia and Preston S. Pinkerton
Instructor: Dr. Paolo Ginobbi
Faculty Advisor: Mr. Glenn Mercier

Abstract:
Many times the ability of a driver to hear an oncoming emergency vehicle is difficult. Our system aims to minimize the amount of ambulance related accidents by alerting the driver of an approaching ambulance responding to a call.

The alert device activates the RF transmitter when the siren and/or lights are turned on. GPS location and direction are acquired from the device in the ambulance and transmitted to any vehicle equipped with our receiver. The receiver then compares its own location and direction to the ambulance. Distance and relative direction is calculated, and then displayed on an LCD panel. At the same time, an audible alert is sounded.

The ability to alert unaware drivers of an approaching emergency vehicle, minimizing unnecessary accidents, makes this system commercially viable.



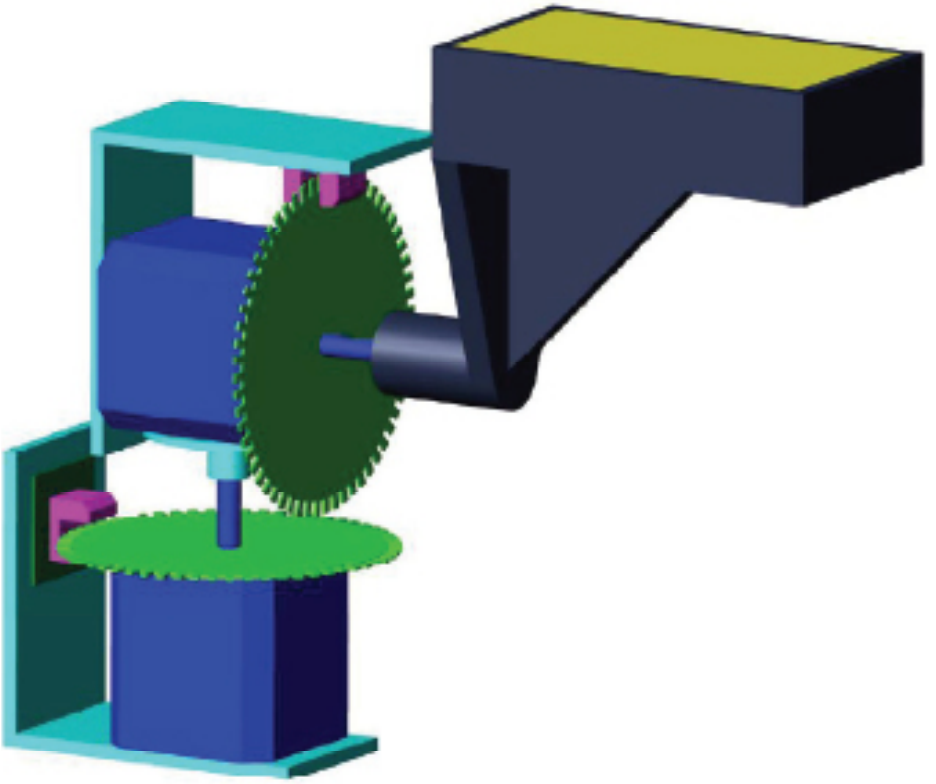
Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 2:00 – 2:30 p.m.

Title: LED Intelligent Light
Department of: Electrical & Computer Engineering
Project Participants: Russell Davis, Daniel Patchin, and Ryan Smith
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Paolo Ginobbi

Abstract
By today's standards incandescent bulbs are considered to be inefficient compared to compact fluorescent light bulbs and LEDs due to their power consumption and relatively short life expectancy. Still, not everyone is eager to adopt compact fluorescent bulbs because they take longer to warm up, provide a harsher color of light, and can flicker. Instead, LEDs are expected to replace traditional bulbs in commercial buildings due to their lower power consumption and maintenance costs.

Our solution is to adapt a cutting edge LED theatrical lighting fixture to solve this problem. Our fixture receives a digital signal from a computer or other interface and changes color and intensity based on that signal. Our design also includes motors that allow our fixture to be focused remotely on any object within a three-dimensional space. These motors also allow our light to create moving sweeps of color that can draw attention to architectural or commercial features of a building much better than stationary lighting.



Senior Design Project Abstracts
Thomas T. Beam Engineering Complex, Great Hall
December 3, 2008

Time: 3:00 - 3:30 p.m.

Title: Headlight Aiming Improvement
Department of: Mechanical Engineering
Project Participants: Susan Doucet, Steven Hughes, and Cameron MacAdams
Instructor: Dr. John Wang
Faculty Adviser: Dr. Mohammed Hossain

Abstract:
The current design for motorcycle headlights is insufficient. A central headlight does not provide enough light when a motorcycle banks while turning. A portion of the light beam is wasted on the ground and another part is wasted in the air leaving a small fractition of the beam actually providing light on the driving surface in the direction of the turn.

To solve this problem, two supplementary lighting devices are added to each side of the motorcycle's fairing. These devices consist of three LEDs each, angled at increasing intervals. One, two or all three LEDs are illuminated depending on the degree of the bank angle. The angle of the bank is determined by infrared proximity sensors placed on the lower fairing. Since the second and third LEDs are angled at 12° and 24° respectively, during any degree of banking, sufficient light is provided on the driving surface in the direction of the turn. Increasing the amount of properly aimed light emitted by a motorcycle provides the rider with an additional line of defense against road hazards, such as oil spills, gravel, potholes and objects. Also, the additional light increases the motorcycle's visibility to other vehicles.

Award Winners

Will be announced
via e-mail on 12/4/08

Congratulations on your achievement.

We look forward to seeing
you at the
Annual Senior Design Dinner
May 1, 2009, Cox Pavilion

UNLV
UNIVERSITY OF NEVADA LAS VEGAS