Fall 2006
Senior Design Competition

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 (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 opportunity to share in the excitement of the students' work.

Instructors for Senior Design Program:

Dr. Paolo Ginobbi – for the Department of Electrical and Computer Engineering

Dr. Shashi Nambisan – Department of Civil and Environmental Engineering

Dr. Walter Vodrazka, Professor Emeritus, Department of Civil and Environmental Engineering

Dr. Zhiyong Wang – Department of Mechanical Engineering

E-Club Faculty Members:

Dr. Laxmi Gewali

Dr. Henry Selvaraj

Dr. Rama Venkat

Dr. Zhiyong Wang

A Special Thanks to Our Senior Design Industry Judges:

Ricco Novero, Game Producer,
Bally Technologies, Inc.

David S. Peterson, SE,
Lochsa Engineering

Justin R. Young, Senior Design Engineer,
Denman Technical Services

9:00 a.m. – 9:30 a.m.

Multi-Zone HVAC Controller

Department of: Electrical & Computer Engineering
Project Participants: Robert Jones, Jr. and Sheldon Johnson
Instructor: Dr. Paolo Ginobbi

Abstract

This project is designed to solve the problem many houses have with uncomfortable temperature gradients from one room to another. It is a retro fit design that will replace your old HVAC controller, with some simple wiring and duct work. Our unit has temperature sensors in the rooms you wish to be controlled and dampers installed in the duct work of the house. If the control unit sees a significant difference in temperature from what you set as your desired temperature it will turn on your HVAC unit. But only allow the hot/cold air to reach the rooms that need it. This will keep all rooms (zones) controlled by the unit at a very similar temperature.

NOTES: _____

9:15-9:45 a.m.

RGB Photometer with serial interface to PC

Department of Electrical & Computer Engineering
Project Participants: Zach Devlin
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Paolo Ginobbi

Abstract

The Photonic Project Group, sponsored by DOE, is working in the UNLV Engineering Department to develop new technologies to improve quality and efficiency of large LED displays, like those found in abundance in Las Vegas.

My project was developed by request of Dr. Ginobbi as a tool to help calibrate LED video displays as part of that project. Beside that specific application and with little modifications, this design can lead to industrial production of low cost color measurement system. The meter allows measurements of RED, GREEN and BLUE components, communicate this parameters to either a LCD display and/or to a remote instrument using an USB port.

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9:30-10:00 a.m.

Silverfish Poison Packet Cutter for Opportunity Village

1) Department of Electrical & Computer Engineering
Project Participant: Tim Nelson
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Rama Venkat

2) Department of Mechanical Engineering
Project Participants: Kim Clark, Stacy Raagas, and Halli Warf
Instructor: Dr. Zhiyong Wang
Faculty Adviser: Dr. Mohamed Trabia

Abstract

This device will assist employees of Opportunity Village, a non-profit organization that provides gainful employment to special needs individuals, in cutting and counting Dekko silverfish poison packet strips. Considering the mental and physical limitations of the workers, the main design concerns were safety and ease of use. Once a strip of six packets is inserted into the machine, an automated cutting process will begin in which the packet strip is sliced and dropped into a holding area. The operator will then be notified, through the use of an LED light, to insert another strip, and the sequence is repeated. A second light will prompt the operator to open a door and remove the packets at the close of the process. With the successful completion of this project, the Opportunity Village employees and their supervisors will be able to efficiently carryout the necessary actions within their Silverfish Poison Packet project.

NOTES: _____

9:45 a.m.-10:15 a.m.

Easy Breezy Moving Solution

Department of Mechanical Engineering
Project Participants: Clayton DeLosier, Patrick Johnson, and Tanya Sloma
Instructor: Dr. Zhiwong Wang
Faculty Adviser: Dr. Brendan O'Toole

Abstract

To make moving easier, faster, and safer, the Easy Breezy Moving Solution is a single component design constructed to power assist an individual with moving heavy, abnormally shaped objects up and down stairs.

The design consists of a single sled that encloses an electric motor, a set of rechargeable batteries, and a treaded drive system. The Easy Breezy Moving Solution is designed with a lightweight structural frame and wide base to make moving any awkward shaped, heavy object up and down stairs easy. Once turned on, the motor is always powered, engaging the simple handbrakes allow control of the speed and direction.

There are two safety precautions, an internal motor brake, and an emergency clip that is connected to your clothing. The internal brake can be engaged to lock the sled in place. The emergency clip will disconnect from the sled and shut-off the motor if the operator travels too far away. The Easy Breezy Moving Solution is designed to be simple to operate and ease moving heavy, abnormally shaped objects up and down stairs.

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10:00-10:30 a.m.

High-Speed Laminar Jets

Department of Mechanical Engineering
Project Participants: Eric G. Wiemers
Instructor: Dr. Zhiyong Wang
Faculty Adviser: Dr. Daniel Cook

Abstract

In the arena of special water effects, there are many options and methods to produce a plethora of effects, yet many of these effects are not well designed from an engineering perspective. Those that are can be extremely expensive to purchase and to implement. One such special effect is high-speed laminar jets, most notably employed in the Bellagio Botanical Gardens whose cost is in the thousands of dollars per jet.

The aim of this project is to design and implement a similar effect, but with a simpler, cheaper implementation. The fountain demonstrates one of the many applications of the design by displaying a choreography of laminar streams of water that dance to music. The nozzles utilize inexpensive, commercially available parts and a simple mechanical design. The control system is called Touch-Tone Choreography which is essentially a set of tones recorded onto a playback device, in this case a CD. When the tones are replayed, each specific tone activates a specific jet.

This overall design increases the availability of affordable visual water effects for private and commercial use by utilizing intelligent design.

NOTES: _____

10:15-10:45 a.m.

Phone Call Filter

Department of Electrical & Computer Engineering
Project Participants: Kevin Baker, Jesse Montgomery, and Emmanuel Opel
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Glenn Mercier

Abstract

The phone call filter is a call screener that eliminates unwanted calls based on call ID information. When an incoming call occurs the phone filter will receive the phone number of the current caller and reference their number against a list of acceptable caller phone numbers programmed by the user. If the current caller's phone number is not in the users list of desired callers, the phone will not emit an audible ring. The user will be able to program the list of wanted callers from a personal computer through the use of an USB flash drive that connects to the phone call filter.

By providing the tools to receive priority calls exclusively, the phone call filter helps to boost efficiency in the workplace as well as providing increased privacy at home.

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10:30-11:00 a.m.

Motorized Car Jack

Department of Mechanical Engineering
Project Participants: Brian J. Goldstein, Kenneth R. Lloren, and Chris S. Stevenson
Instructor: Dr. Zhiyong Wang
Faculty Adviser: Dr. Mohamed B. Trabia

Abstract

The objective of our project is to construct a reliable, simple, and practical car jack. After conducting research on a variety of cars, from compact cars to trucks, our team has assembled a car jack that reduces the technical difficulties and risks involved when changing a tire.

The materials used to construct the jack have the ability to withstand the weight of the car. The scissor type design adds more inches off the ground that the car can be lifted. The motorized component to the jack, powered by the cigarette lighter, eliminates the tedious and often tiresome cranking required by the current jack on the market. This component makes the jack more accessible to the elderly. It is also easier for the inexperienced to use. In addition, the motor will reduce the amount of time it takes to switch tires. The jack accomplishes its purpose effectively and efficiently.

NOTES: _____

10:45-11:15 a.m.

Handicap Phone

Department of Electrical & Computer Engineering
Project Participants: Tarik S. Bakir and Elias Kheirr
Instructor: Dr. Paolo Ginobbi

Abstract

We are designing a telephone that can be easily used by handicaps. Our project consists of two parts. The first part is the remote control that is used to make and receive calls. This remote control has only four buttons in it. One of the buttons will turn the telephone speaker on or off. The other three buttons will have three phone numbers stored in them. These are the phone numbers of three people that the user frequently contacts, either relatives or emergency contacts. The user can easily call any one of these numbers by pushing one of the three buttons.

The second part of this phone is the caller ID. The caller ID has a voice chip that says the number of the person who is calling. This will allow the user to know who is calling without moving.

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11:00-11:30 a.m.

Project GREEN (Green Valley Ecology, Environment, and Nature) Phase III

Department of Civil and Environmental Engineering:
Project Participants: Bisrat Alemayehu, Lexido De Los Santos, and Jason Ghadery
Instructor: Dr. Shashi S. Nambisan
Faculty Adviser: Dr. Thomas Piechota
Practitioners and Community Mentors:
Curt Chandler, P.E., Land Development Manager, City of Henderson,
Albert Jankowiak, P.E., Project Engineer II, City of Henderson

Abstract

The City of Henderson, Nevada is seeking a habitat restoration and protection program for the Pittman Wash as a valuable resource to the community.

A trail adjacent to and in the Pittman Wash will be designed within this approximate 2.5-mile stretch of the Pittman Wash between Arroyo Grande Boulevard and Pecos Road. The required technical data and specifications were obtained from the City of Henderson and Kimley-Horn Associates, Inc. Hydrologic modeling was performed using HEC HMS and HEC DSS software. Adoption of the Clark County Regional Flood Control District Master Plan Hydrology model for real-time flood forecasting was also used to develop the hydrologic model.

The overall objectives of Project GREEN are to remove invasive tamarisk, re-establish native riparian habitat, and provide public education and access in the form of a recreational trail in Pittman Wash. Our vision for our phase of Project GREEN was to establish a new hydrologic model using real-time flood forecasting and evaluate different types of channel linings within the Pittman Wash.

It was determined that gabions are the best alternative for this particular wash based on our investigation and results of the HEC-HMS model.

1:15-1:45 p.m.

Wireless Data Transceiver

Department of: Electrical and Computer Engineering
Project Participants: Younes Amermouch, Percival O. Lucban, and Timothy Toth
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Paolo Ginobbi

Abstract

Present a project that will be used for data exchange. The inspiration stems from a need for information exchange specifically for trade show environments. As a result of our efforts, the construction, programming, and testing provides people with the ability to exchange information via a wireless transceiver that interacts with other similar transceivers.

NOTES:

1:30-2:00 p.m.

Parking Lot Space Availability Notifier System

Department of: Electrical & Computer Engineering
Project Participants: Kristal Sauer, Niveen Shlayan, and Stephen Tam
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Venkatesan Muthukumar

Abstract

Efficient management of parking lot activity is vitally important for various reasons. First, consider special events, which are usually characterized by the concurrent arrival of a multitude of cars, which must be quickly directed to topographically optimal locations. This normally requires that a whole team of parking attendants be hired to supervise drivers, which is a costly solution with limited effectiveness.

Also consider contrasting situations in which relatively few cars are arriving and departing at any given time. This is often the case in urban parking lots and garages found in casinos, hospitals, malls, etc. Traffic flow is often clogged by drivers circling the lot or following each other to find convenient parking spots. Sometimes, in retail areas, parking lot frustrations are so bothersome that drivers (potential customers) abandon their purchasing plans and depart, causing loss of business to the owner.

Examination of these scenarios and others clearly illuminates the problems present in current parking systems, and conversely, the potential benefits that might result from a robust electronic system capable of intelligently directing traffic.

We have created a system, consisting of solar-powered sensing units with wireless transmission capability and a central unit with a graphical display to guide drivers to the most favorable parking sites. We believe that our system has exciting applications in a wide variety of domains and will greatly enhance the parking experience for drivers, event planners, and business owners.

1:45-2:15 p.m.

Pool Safety Perimeter

Department of: Electrical & Computer Engineering
Project Participants: Jennifer Aden and Shawnta Horton
Instructor: Dr. Paolo Ginobbi
Faculty Adviser: Dr. Rama Venkat

Abstract

According to the U.S. Consumer Product Safety Commission, 350 children under the age of five drown each year in swimming pools. Additionally, an estimated 2, 600 children under five are treated in emergency rooms due to a submersion incident. In Southern Nevada, drowning is the leading cause of unintentional death for young children. We have designed and built a prototype of a system that will help to prevent incidents such as these from occurring.

The Pool Safety Perimeter is an infrared perimeter system that will sound an alarm when a child enters the pool without adult supervision. The infrared beams vary in height and depth and the system determines if a child has entered the area without an adult based on which beams are reflected back to the infrared receiver.

This projects differs from other existing designs in that our system detects a reflection when a person is passing through the perimeter, rather than an interruption. Other designs currently on the market require that the emitting beams be perfectly aligned with either a mirror or detector that reflects or detects the beam. Since our design does not have this requirement, we have eliminated any misalignment problems due to wind, ground settling, etc., and thus have improved the design.

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2:00-2:30 p.m.

Parking Meter Violation Enforcement System

Department of Electrical & Computer Engineering
Project Participants: Jeffery Bacala and LeVaughn J. Riofta
Instructor: Dr. Paolo Ginobbi

Abstract

Our project is a system of devices that will compliment current parking meters and help inform Parking Enforcers about parking meter violations sooner via power line and wireless communication.

Each parking meter will be equipped with our Parking Meter Device. When a parking meter violation occur information about the parking violation is sent along the system of Parking Meter Devices to a Computer Interface Device. The Parking Meter Devices sends and receives information through currently existing power lines and wireless communication. While the Computer Interface Device at the other end of the power lines will manage and inform which parking meter is in violation via serial computer interface connection. The reason for power line and wireless communications is reliability, if communication failure occurs. Our devices will also be powered using existing power lines because batteries would have to be routinely changed.

Our project would provide Parking Enforcers with a fast and efficient way to recognize and enforce parking violations. Parking Enforcers doesn't have to physically check every parking meter for a violation, just the ones our device detects as a violation. This would result in less labor by Parking Enforcers, reduced cost to employ large amount of Parking Enforcers, and reduced cost of transportation, including maintenance and other supplies to maintain vehicles.

Our project would also provide users of parking meters with a stricter system of enforcing parking violations. Users will be enforced to avoid parking violations or they will be punished.

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2:15-2:45 p.m.

Bus Tracking System

Department of Electrical & Computer Engineering
Project Participants: Tak Chang, Ravigrid Charoenbanpachon, Samuel Fukuhara
Faculty Adviser: Dr. Paolo Ginobbi

Abstract

The purpose of the Bus Tracking System is to help bus riders by providing them with information about the locations of buses. With this information, the bus rider would be able to minimize time for his or her bus, thus removing one of the greatest annoyances of public transportation. Bus location data will be collected using infrared, and sending this information through a RF module. This information will be collected and analyzed.

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2:30-3:00 p.m.

Mountain Edge Parkway Interchange

Department of Civil and Environmental Engineering
Project Participants: Carolyn Keller and David Keller
Instructor: Dr. Shashi Nambisan
Faculty Adviser: Dr. Walter Vodrazka, Professor Emeritus
Community Mentor: Randy Fultz, Assistant City Engineer, City of Las Vegas

Abstract

Mountain Edge Parkway is a proposed roadway that will connect into the 215 Bruce Woodbury Beltway between the existing Ann Road and Hualapai Way exits and continue north and then east to connect into the I-15 near the Las Vegas Motor Speedway. The purpose of this design was to develop a cross-section for the portion of the parkway between Grand Teton Drive an Iron Mountain Road. This segment was required by the client, the City of Las Vegas, to be depressed and to include right-of-way for 5 lanes of traffic in each direction, multi-use trails, future light-rail, and drainage facilities. Additionally, the design team was tasked with developing a design for the interchange of Mountain Edge Parkway and US-95. The interchange was required to handle 50 year projected traffic flows.

To develop the cross-section research was done on existing Clark County standards for lane widths, multi-use trail requirements, as well as existing light-rail designs for reference. The interchange was designed to minimize merging and provide a minimum LOS D during peak hour flows. The final design included both one- and two-lane ramps. A peaking factor of 0.7 was used to determine the peak hour flows from the provided 50-year projected average daily traffic flows.

The design team also took the liberty of addressing alternative land-uses for the cross-section right-of-way as well as the footprint created by the interchange. It was suggested to provide a widened median or areas within the drainage easement to implement solar or wind energy equipment. The close vicinity to the Kyle Canyon Gateway project, a more sustainable-minded master planned community, lends easily to the extension of those same elements to one of the main access ways to the community. The design also proposed the development of a park-and-ride and/or future light-rail hub in the available space to the southeast of the interchange. This area was defined as an ideal place to implement a transportation hub due to its direct access to the US-95 and Mountain Edge Parkway as well as its close vicinity to the 215 Bruce Woodbury Belt.

3:00-3:30 p.m.

Automated IAC-CPR Machine

Department of: Mechanical Engineering
Project Participants: Lawrence Garcia, David Hanson, and Paul Lawson
Instructor: Dr. Zhiyong Wang
Faculty Adviser: Dr. Woosoon Yim

Abstract

For victims of cardiac arrests, cardiopulmonary resuscitation (CPR) is still an essential tool for saving lives. Unfortunately CPR techniques have limitations in the amount of blood that can be circulated in the patient and ultimately depends on the rescue workers abilities to perform the technique. As the rescuer gets tired, the depth of the chest compression and timing can be skewed and will affect the patient's survivability.

Interposed Abdominal Compression Cardiopulmonary Resuscitation (IAC-CPR) is a modified CPR technique. This technique is rarely practiced today because of its complexity. If performed manually in the field, this technique requires at least three rescue workers when compared to standard CPR which can be performed with only one person. It still involves all the standard CPR procedures but employs an additional person providing compressing on the abdomen as well. The compressions alternate between the abdomen and chest. The additional compressions increase the systemic blood pressure of the patient and increase the change of survivability for patients of acute cardiac arrests.

We have developed a concept that will perform IAC-CPR and requires only one person to effectively administer the technique. Our prototype performs the technique using a two-belt system powered by DC motors and controlled by dual feedback. The system is completely mobile and durable enough to be applied in any emergency situation. This device can be adjusted to any body size and has safeguards to prevent overloading the patient which is a common and potentially a life treating mistake. This machine will save lives.

Student Participants . . .

Mark Your Calendars
and Save the Date:

Friday, May 4, 2007

6th Annual
Senior Design Dinner
6:00 - 9:00 p.m.
Cox Pavilion

The Howard R. Hughes

College of Engineering

Applauds Your Efforts!