

CELEBRATE THE SPIRIT OF
ENTREPRENEURSHIP...

FALL 2005
SENIOR DESIGN COMPETITION

*The Howard R. Hughes
College of Engineering*

DECEMBER 7, 2005

UNLV
UNIVERSITY OF NEVADA LAS VEGAS



Image courtesy of Phoenix International, Inc.

FALL 2005

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 Electrical, Computer, Mechanical and Civil 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. Shashi Nambisan – Department of Civil and Environmental Engineering
Bill O'Donnell – for the Department of Computer and Electrical 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:

Adam C. Godorov, Project Manager,
Nevada Power Company

Kevin McOsker, P.E., Principal Engineer,
Clark County Department of Development Services

Michelle Miller, Project Manager Nuclear Nonproliferation,
Bechtel Nevada

SCHEDULE OF SENIOR DESIGN PROJECT PRESENTATIONS
THOMAS BEAM ENGINEERING COMPLEX
DECEMBER 7, 2005

9:00-9:30 a.m.

H.O.M.I.S Home Security Robot

Department of Electrical and Computer Engineering

Project Participants: Chris Hicks, Kraig Otani, and Samuel Martinez Jr.

Instructor: Professor Bill O'Donnell

Faculty Adviser: Dr. Sharam Latifi

Abstract

HOMIS, an autonomous robot, concentrates on three main aspects. First, the robot possesses the ability to detect an occurrence through the use of audio and motion sensors. Second, the robot is capable of navigating a floor plan and avoiding obstacles within the home. HOMIS is not aware of its position within the home, but has the ability to locate a security threat. Finally, HOMIS provides communication and real time notification to the user of detected disturbances by the robot. The robot provides evidence of the occurrence including a live video feed and details of any occurrence.

NOTES: _____

9:15-9:45 a.m.

Hand Tracking System

Department of Electrical and Computer Engineering

Participants: Kevin Salisbury and Isaac Juarez

Instructor: Professor Bill O'Donnell

Faculty Adviser: Dr. Venki Muthukumar

Abstract

Our project was created to allow a more efficient method of tracking selections made by players within the gaming industry. The use of touch screens within the gaming industry is very well known and prolific; however, touch screen technology is very bulky, thus leading to more casino floor space being consumed. Therefore, to alleviate the loss of space, the industry has decided to move upward (literally) and add tracking systems that use the players' hand as a selector. Through the use of Infrared and Ultrasound sensors, we are able to track an object (up to 60 cm away) in front of a computer screen, and then place the location onto the screen. Upon further research and development, one will be able to take this tracking ability to the next level, and allow the location of the hand to be the selector, without even touching the screen.

NOTES: _____

9:30-10:00 a.m.

Automatic Home Window Blinds

Department of Electrical and Computer Engineering
Participants: Maria Salomon and Patraratorn Penparkgoon
Instructor: Professor Bill O'Donnell
Faculty Adviser: Dr. Biswajit Das

Abstract

The automatic window blinds will regulate the temperature inside a room during the winter months. This process will allow sunlight to heat the room when it's cool and restrict the sunlight when it's warm. With the desired temperature specified, the automatic window blind sequencer system will continually measure the temperature of the room and the intensity/direction of sunlight. When the room reaches the minimum temperature setting, the automatic window blind system will align with the sunlight direction and systematically maintain a maximum amount of light into the room. When the room reaches the maximum temperature setting, the automatic window blind system will close blocking the sunlight. A wireless remote control gives the user an on and off feature as well as the ability to initialize the automatic window blind system to desired specifications.

NOTES: _____

10:00-10:30 a.m.

Direct Hydrogen Injection

Department of Mechanical Engineering

Participants: Hiroshi Aoshima, Bryan Ganitano, and Marc Newmarker

Instructors and Faculty Advisers: Dr. Robert Boehm and Dr. Zhiyong Wang

Abstract

Our goal is to design a hydrogen fuel injector for use on direct injection internal combustion engines. Through the use of a servo motor, a spring and a rotating assembly, a simple, cost effective product can be produced. Through testing, it can be determined if the design is reliable and safe. By using both readily available parts as well as custom manufactured parts the best product can be designed and built.

NOTES: _____

11:15-11:45 a.m.

Design of a Multiuse Trail in Henderson

Department of Civil and Environmental Engineering

Participants: Thomas Ackeret, Jenner Costello, Jeremy Crew,
and James Graves III

Instructor: Dr Shashi Nambisan P.E.

Faculty Adviser: Dr. Shashi Nambisan, P.E.

Community Mentor: Milke Colety, P.E., Kimley-Horn & Associates

Abstract

The proposed project is to implement a one mile long path adjacent to the Union Pacific Railroad tracks. The project is located in Henderson, Nevada between Greenway Road and Arrowhead Trail. The finished path will create a more aesthetically pleasing section of the town by landscaping the trail, and promoting pedestrians and bicycling enthusiasts with a form of physical recreation opportunity. This will promote a dual usage of the path to increase total utility and maximize the cost to benefit ratio experienced by the City of Henderson.

NOTES: _____

11:15-11:45 a.m.

Clayton Street / Gowan Channel Bridge Design

Department of Civil & Environmental Engineering

Participants: Justin Fenton, Zack Micoletti, and Jason Thomson

Instructor: Dr. Shashi Nambisan, P.E.

Faculty Advisor: Dr. Gerald Frederick, P.E.

Community Mentor: Mr. Chuck Joseph, P.E., Carter-Burgess

Abstract

At Gowan Channel in North Las Vegas, Clayton Street currently serves two lanes of traffic with a triple cell, reinforced concrete box culvert bridge that is about 50 feet wide. There is a need to redesign this section of Clayton Street to accommodate 5 traffic lanes. A new simple single span bridge over the channel is designed in this project. The design will allow for a 100-year flood flow in the channel, accommodate 5 traffic lanes as well as bike lanes and pedestrian walkways. The project encompassed the following tasks: develop and evaluate alternative designs, conduct hydrologic analyses and design the new channel, abutments and bridge deck for the selected design, develop traffic lane delineations, develop construction staging and traffic routing plans during the construction, prepare design drawings for all aspects of final design, and estimate quantities and costs for materials needed for the selected bridge. A concrete bridge deck design was developed with a 5 inch concrete deck, supported by girders spaced 4 feet on center and this provided a 1 foot freeboard above the projected 100 year flood event in the channel.

NOTES: _____

11:15-11:45 a.m.

Solar Charge Controller and Wireless Power Meter

Department of Electrical and Computer Engineering

Participants: Edgar Yanga and Joseph Vernaci

Instructor: Professor Bill O'Donnell

Faculty Adviser: Dr. Ebrahim Saberinia

Abstract

The solar charge controller is designed to monitor an “off grid” house powered by solar energy and batteries. It is responsible for ensuring the proper charging and discharging of the battery array by utilizing solar panels and a back-up generator, while also supervising the power usage of the house. When usage levels go outside of preset limits, the controller can enable or disable the back-up generator to minimize strain on the batteries. All data gathered by the charge controller is transmitted to the wireless power meter where status information is displayed to an LCD. A “power difference” button on the handheld meter allows the user to monitor increases or decreases in power as appliances are turned on and off inside the house.

NOTES: _____

1:00-1:30 p.m.

Ohana Estates Land Development Project

Department Civil and Environmental Engineering

Participants: Julia Creel, Maria Jimenez, and Scott Ferguson

Instructor: Dr. Shashi Nambisan, P.E.

Faculty Advisor: Dr. Tom Piechota, P.E.

Community Mentor: Mr. Ted Egerton, P.E., Lochsa Engineering

Abstract

This project consists of a parcel of land, approximately 2.5 acres in size, to be developed into four residential lots. The tasks involved include identifying and evaluating three alternatives, selecting a preferred alternative, performing a technical drainage / hydrological study, conducting a water distribution network analysis, completing a preliminary traffic study. The lots are graded for pads only and the subdivision has a gate controlled access. The criteria used from these studies are used to design construction documents in accordance with Clark County, Las Vegas Valley Water District, and City of Las Vegas standards with details of the on-site and off-site improvements. The resulting design documents include the following: cover sheet, notes sheet, grading plan, utility plan, preliminary profiles for the streets and utility lines, and cross sectional details for streets and interior lot boundaries.

NOTES: _____

1:15-1:45 p.m.

Auto Accident Avoidance System

Department of Electrical and Computer Engineering

Participants: Ignacio Aguilar, Joe Huerta, and Martin Villasenor

Instructor: Professor Bill O'Donnell

Faculty Adviser: Dr. Rama Venkat

Abstract

Imagine driving and being alerted in real time of an accident ahead. The Auto Accident Avoidance System does just that. It is a GPS guided device that generates an alert to the driver if an accident is in their eminent path. The system is composed of five main components: the accelerometer (sensor), microcontrollers, global positioning system (GPS), transmitter/receiver, and output devices (voice chip and LCD). Principally, the system is waiting for a signal generated from a high G impact. Once a signal is detected it will then download the GPS data and parse only the needed information—longitude, latitude, and direction. It will send this information to surrounding vehicles that are in the path of the accident only. The driver will be alerted by an audible signal generated by a voicechip and will also be displayed on an LCD screen.

NOTES: _____

1:30-2:00 p.m.

Automated Car Visors

Department of Electrical and Computer Engineering

Participants: Alfred Hau and Doug Wettekin

Instructor: Professor Bill O'Donnell

Faculty Adviser: Dr. Emma Regentova

Abstract

The project concerns with the development of an automatically controlled car visor system. They are intended to block the direct sun light such that the driver and a passenger are protected from the direct sun light as the car moves and changes its direction. The system utilizes 5 light-to-voltage photo diodes, a microcontroller, and 4 stepper motors. The photo diodes will be placed on a circular disk with dividers sectioning off equal area for each photodiode. When sun shines on the photodiodes, the microcontroller will receive the differences of voltages caused by the divider's shadow and calculate the approximate location of the sun. Then the microcontroller will tell the appropriate motorized visor or visors to move so that it blocks the sun from the driver and passenger.

NOTES: _____

1:45-2:15 p.m.

W.A.T.S. – Automatic Plant Watering System

Department of Electrical and Computer Engineering

Participants: Houston Osemwengie and O'Dealya Price

Instructor: Professor Bill O'Donnell

Faculty Adviser: Dr. Robert Schill, Jr.

Abstract

Water According to Soil (W.A.T.S.) automated plant watering system is designed to water plants based on the dryness of soil, instead of watering by a timer. By measuring soil resistance every so often, the soil conditions are immediately obtained. Therefore, the watering needs of the plant are accurate and inherently reflect the moisture content of the soil. Bearing in mind that soil properties differ by geographical regions, the WATS system has been restricted to the Las Vegas area.

NOTES: _____

2:00-2:30 p.m.

REM Sleep Detector

Department of Electrical and Computer Engineering

Participant: Arnaldo Gaytan

Instructor: Professor Bill O'Donnell

Faculty Adviser: Dr. Rama Venkat

Abstract

This project develops a low cost method for monitoring REM (rapid eye movement) sleep activity during any given sleep cycle. This is achieved by placing two electrodes on the subjects scalp to detect the minute electrical activity that occurs in the brain during REM sleep. The signal is then injected into an instrumentation amplifier to amplify the brain activity. From this stage the signal is then filtered to eliminate any background noise and DC offset that is present in signal. The signal from the electrodes are then stored on a PC where this can be displayed, transmitted or stored into other media formats. This unit will help monitor quality and quantity of sleep from a home setting making it easier to monitor subjects over extended periods of time instead of over a single night in a sleep laboratory.

NOTES: _____

2:15-2:45 p.m.

Solar Water Distiller

Department of Mechanical Engineering
Participants: Allison Gray and Julian Gardner
Instructor and Faculty Adviser: Dr. Robert Boehm

Abstract

A solar water distiller was designed and built to optimize distilled water production by utilizing solar energy as a power source. The objective is that this will be used at a hydrogen filling station located at the Las Valley Water District. The solar distiller utilizes solar energy to produce distilled water which will be used in an electrolyzer to produce hydrogen. Equations from publications on thermal modeling of solar stills were used to analyze theoretical and actual output under varying conditions. Studies have not yet been found where a solar distiller has been used in conjunction with an electrolyzer to produce hydrogen.

NOTES: _____

2:30-3:00 p.m.

Indoor Defecation Detection Device (IDDD)

Department of Electrical and Computer Engineering

Participants: Lisa Philips and Brian-John Ezeli

Instructor: Dr. Bill O'Donnell

Faculty Adviser: Dr. Jieng Tao

Abstract

This project is designed to inform a dog owner when their pet dog is about to defecate indoors. It does the task by acquiring data measurements from the dog, analyzing this information and then sending it to the pet owner. For our project we will be using RF transceivers for wireless communication; buzzers and resonating devices for stimulus and alert, I-R sensors and accelerometers for data acquisition and the microcontroller for performing the different tasks. The device will be run by a 5V battery and properly housed in a comfortable dog strap.

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