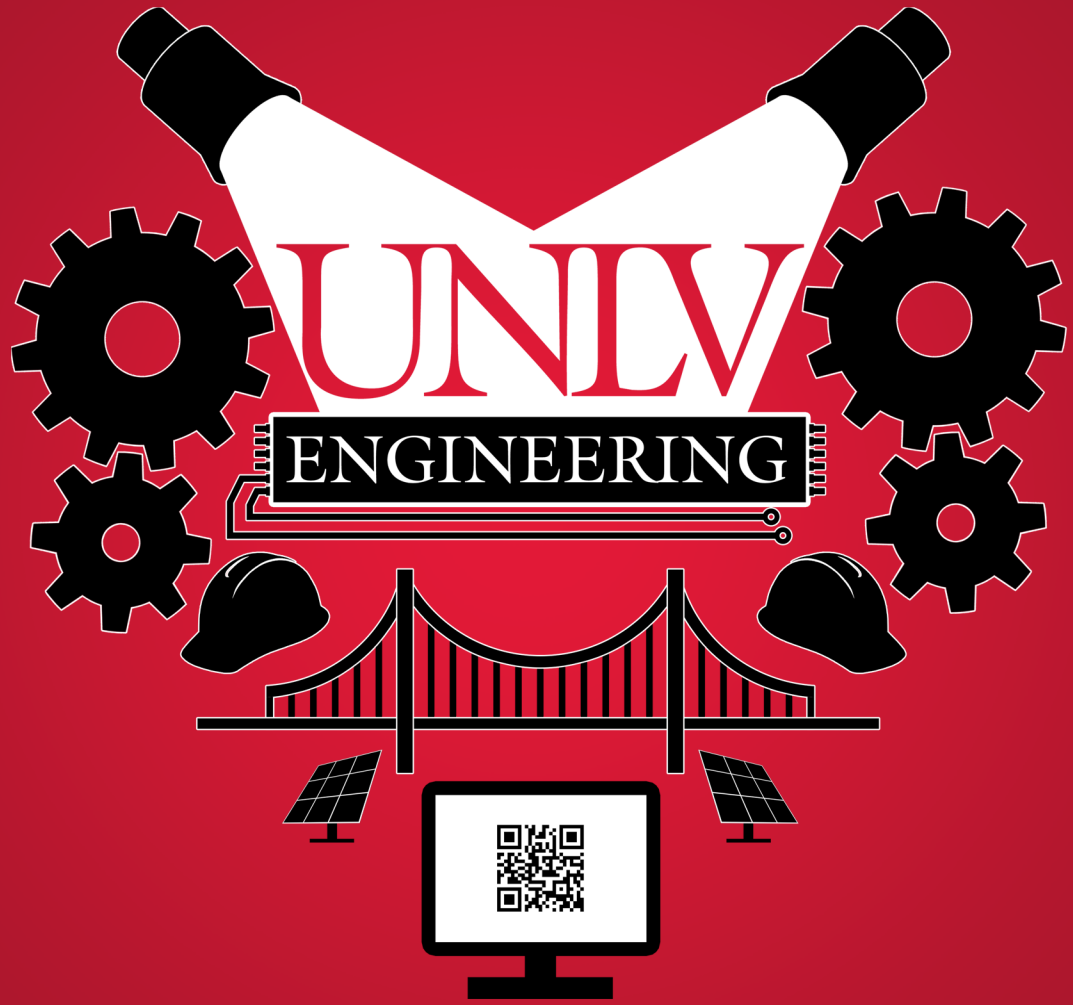
FRED AND HARRIET COX
SENIOR DESIGN COMPETITION



May 4, 2017

Fred and Harriet Cox

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 they learned in their academic program 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.

Reward and Recognition

A team of industry judges choose 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. Through the generosity of patrons Fred and Harriet Cox as well as award sponsors, the College of Engineering reimburses teams for the costs associated with the creation of their prototype. This ensures that teams are not working under unfair financial constraints, but have the resources they need to excel.

Taking it Further

Senior Design teams are offered the opportunity to partner with MBA students from the Lee Business School to create a business plan as part of the MBA curriculum. This collaboration has led to great success at the Dominic Morrocco Southern Nevada Business Plan Competition, the Governor's Cup and the subsequent creation of many successful businesses.

Additionally, engineering alumnus Chad Miller offers pro bono services to assist students in filing provisional patents on Senior Design projects. Teams who file a provisional patent are offered an additional financial incentive.

Get Involved

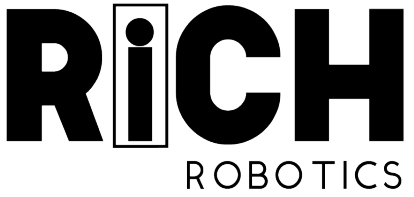
Teams often get project ideas from industry partners or friends of engineering who have an interesting problem or concept they would like to submit. Teams may also be looking for an industry mentor or coach to help them throughout the year as they work on a project.

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 Molly Marks, Director of Special Events, at Molly.Marks@unlv.edu or 895-3281.

Senior Design Clinic

In its second year, the College of Engineering's Senior Design Clinic continues to serve as a unique experience in which companies will be able to partner with the students to work on specific challenges to find business solutions. To find out how to get involved in this exciting new venture, please contact Professor Pushkin Kachroo at pushkin@unlv.edu or (702) 895-4926.

Thank you to our Sponsors!



Thank you,
Senior Design Instructors!

Department of Civil & Environmental Engineering and Construction
Dr. Douglas Rigby

Department of Computer Science
Dr. Ju-Yeon Jo

Department of Electrical and Computer Engineering
Brandon Blackstone

Department of Entertainment Engineering and Design
Dr. Si Jung Kim

Department of Mechanical Engineering
Dr. Zhiyong Wang

Table of Contents

Spring 2017 Senior Design Judges

Harshal B. Desai

Vice President
ATKINS

Harshal obtained his Masters of Science degree in civil/environmental engineering from Purdue University in 2001, and a Bachelor's degree in civil engineering from Gujarat University (India) in 2000. He is a registered professional engineer and certified floodplain manager and has been very active in the local engineering community serving on the NSPE's State Chapter Board, American Council of Engineering Companies' Nevada Board, and the Advisory Board for University of Las Vegas (UNLV) engineering school.

Harshal is a Vice President with Atkins North America. He currently leads strategy and business development efforts for municipal and private business for Atkins. His engineering and project management experience revolves around water resources projects across the United States and beyond.

He has often been recognized for his accomplishments, including being named one of ENR's Top 20 under 40 for 2015. He was also named Young Engineer of the Year by the National Society of Professional Engineers (NSPE) – Southern Nevada Chapter in 2013 and, in 2008, received the Project Management Award as part of Atkins' National Founders Award program.

Jean-Philippe Laguerre

Sr. Client Executive, Academia & Research North America Dassault Systèmes of Americas Corp.

JP Laguerre is Senior Client Executive for Academia & Research in North America with Dassault Systèmes, the 3DEXPERIENCE Company that provides end-to-end software, content and services, designed to support companies' innovation processes. In his role, he manages activities and relationships with academic institutions across North America to transform engineering education. He also works with Dassault Systemes commercial customers to orchestrate and execute outreach programs focusing on Sciences, Technology, Engineering and Maths (STEM).

Formerly, JP Laguerre had management responsibilities with DS commercial customers in various industries. He has more than 20 years of experience in sales, engineering and project execution.

He joined Dassault Systemes in 1996 in Tokyo, Japan as a sales domain lead for the manufacturing solutions working with aerospace suppliers, automotive manufacturers and suppliers. He then transferred to California in the same capacity for North America.

Born in France, he holds a Master's degree in Engineering from The Polytech Group.

JP Laguerre serves as a mentor for the First Robotics Competition in Boyle Heights - CA, volunteering his time with the i.am.angel Foundation to TRANS4M Lives.

John Fountain, Jr.

Director of Technology
Cox Business/Hospitality Network

John Fountain is the director of technology at Las Vegas, Nev.-based Cox Business / Hospitality Network (CB/HN), the business-to-business division of Cox Communications serving business and commercial customers in Southern Nevada, as well as over 110,000 hotel rooms in areas of the resort-gaming-hospitality industry across the U.S. In his current position, Fountain oversees the provisioning of advanced video, voice and data services on digital, analog, IP and Wi-Fi platforms to guest rooms, back office and public areas of the resort-gaming-hospitality vertical. He has responsibility for 24 employees and manages large-scale annual project budgets.

Fountain has been with Cox since it entered the Las Vegas market in October 1998 through its acquisition of Prime Cable. At that time he served as high-speed data operations manager with responsibility for operations, design and development of residential and commercial telecom services, including field services and call center support. He continued in this capacity with the new company until his transition to senior manager of business development in June 1999 when responsibility for sales and marketing efforts were added to a number of his previous duties. From December 2000 to December 2001 he served as director of broadband engineering and provided strategic support for local and national product development efforts. For nine months in 2001 he served as an interim vice president for construction and network operations with responsibility for over 200 employees. From 2001 to 2008 he served as vice president of technology at CB/HN with enhanced responsibilities including budgeting and supervision of 35 employees. His diverse background also covers technical operations related to the provisioning and maintenance of integrated voice, video and data services over a hybrid-fiber network.

Fountain supervises and manages the deployment of advanced video, wired Internet and Wi-Fi technologies at dozens of casino-resorts in Las Vegas and throughout the U.S., as well as at the Las Vegas Convention Center, Cashman Center and soon to open T-Mobile Arena in Las Vegas for which he was a core member of the team to win the contract as technology/integration partner. He plays a critical role in overseeing the current deployment of a Distributive Antenna System at the Las Vegas Convention Center, and previously video on demand systems and wired Internet at City Center in Las Vegas.

His career background outside of Cox includes 12 years of software development for embedded and application-level systems, project management for government contractors and management of IP networks. From 1984-1987, Fountain served as an adjunct computer science instructor at the University of Nevada, Las Vegas (UNLV).

Vamsee K. Pamula

Founder and President
Baebies, Inc.

Vamsee K. Pamula is a Founder and President of Baebies, Inc. whose mission is to ensure that everyone gets a healthy start. Prior to this, he was co-founder and chief technology officer of Advanced Liquid Logic Inc (sold to Illumina), where he developed digital microfluidics products for various applications. His current research interests include development of inexpensive and accessible newborn screening and pediatric patient testing products. He serves as a principal investigator on several projects funded by the NIH, served as a peer reviewer for many journals and for NIH, has given numerous talks on digital microfluidics, has published over 60 articles, authored 5 book chapters and a book, and has over 420 issued and pending patent applications. He has a PhD in electrical and computer engineering from Duke University. He is on the graduate faculty at the Department of Electrical & Computer Engineering at Duke University and has served on many PhD thesis committees.

Laurence A. Price

Orion Deputy Program Manager
Lockheed Martin Space Systems Company

Laurence A. Price joined Lockheed Martin in 1982 and was appointed to his current position as Deputy Orion Program Manager in 2005. He is responsible for the development of NASA's Orion crew exploration vehicle.

Price previously served as Director of Space Transportation Strategic Development where he was responsible for Lockheed Martin Launch Systems' long-term direction addressing Department of Defense, NASA and commercial space transportation systems. In addition, Price led the Alternate Access to Space Station project, which developed a commercial logistics capability to autonomously deliver and return space station cargo.

As the Director of Small Launch Vehicles, Price was responsible for the Athena and Multi-Service Launch System launch vehicle programs. The program team successfully launched the first flights of the Athena I and Athena II space launch vehicles and developed launch complexes at Vandenberg Air Force Base, California; Cape Canaveral, Florida; and Kodiak Island, Alaska. During this assignment, he was responsible for the launch of five Athena I and II vehicles for NASA and commercial customers including Taiwan's first space launch, and 2 MSLS vehicles for the Air Force.

Price also served as Director, Titan II Space Launch Vehicle program, and was responsible for cost schedule and performance of the Air Force Titan II system. In addition, Price was a project engineer on the NASA Space Shuttle Air Force payload integration contract responsible for the design and qualification of a cargo bay contamination instrument Ascent Particle Monitor which flew numerous times. He was also responsible for mission planning and integration of two Shuttle payloads, Storable Fluid Management Demonstration and Interim Operational Contamination Monitor.

Prior to joining Lockheed Martin in 1982, Price was a project manager at Los Alamos Technical Associates, New Mexico, responsible for analysis and testing of nuclear weapons effects on aerospace structures. He also worked as a project engineer at Hughes Helicopter Company, California, responsible for development and FAA certification of improvements to the OH-6A helicopter.

Senior Design Competition

Presentation	Time	Pro
PRESENTATION 1	8:00 AM	Damping System Test Drop Towe
PRESENTATION 2	8:15 AM	Project Apollo: Automated Helioc
PRESENTATION 3	8:30 AM	Card Shoe Projection System
PRESENTATION 4	8:45 AM	Jox-T
PRESENTATION 5	9:00 AM	FLTR
PRESENTATION 6	9:15 AM	Scintillator and Silicon Photomult
PRESENTATION 7	9:30 AM	Casino Dice Project
9:45 AM - 10:00 AM BREAK		
PRESENTATION 8	10:00 AM	The Hi Ball
PRESENTATION 9	10:15 AM	LVB Light Rail
PRESENTATION 10	10:30 AM	CLT
PRESENTATION 11	10:45 AM	A.P.E.L.
PRESENTATION 12	11:00 AM	Micro Grid II: Controls and Revis
PRESENTATION 13	11:15 AM	Coanda Quadcopter
PRESENTATION 14	11:30 AM	CASH
PRESENTATION 15	11:45 AM	Wastewater Evaporator
PRESENTATION 16	12:00 PM	The Electrical Tester
PRESENTATION 17	12:15 PM	Universally Expanding Cage - ME
12:30 PM - 2:00 PM LUNCH		

Presentation Schedule

roject Title	Department
ower	Mechanical Engineering
liodon V2.0	Mechanical Engineering
	Electrical and Computer Engineering
	Mechanical Engineering
	Computer Science
ultiplier High Energy Radiation Detector	Interdisciplinary
	Electrical and Computer Engineering
	Entertainment Engineering and Design
	Civil and Environmental Engineering and Construction
	Computer Science
	Interdisciplinary
evisions	Electrical and Computer Engineering
	Mechanical Engineering
	Computer Science
	Mechanical Engineering
	Electrical and Computer Engineering
ME Team	Mechanical Engineering

Senior Design Competition

Presentation	Time	Pro
PRESENTATION 18	2:05 PM	Universally Expanding Cage - EE
PRESENTATION 19	2:20 PM	Bombyx Mori Silk Antimicrobial
PRESENTATION 20	2:35 PM	Demand Responsive Pedestrian Sa
PRESENTATION 21	2:50 PM	Z-Med Alert
PRESENTATION 22	3:05 PM	Spots
PRESENTATION 23	3:20 PM	Hailey's Hand Version 3.0
PRESENTATION 24	3:35 PM	Micro Grid II: Load Share
3:50 PM - 4:05 PM BREAK		
PRESENTATION 25	4:05 PM	Harco Spray Gun
PRESENTATION 26	4:20 PM	UNLV Paradise Campus Flooding
PRESENTATION 27	4:35 PM	Carpel Tunnel Relief Massager
PRESENTATION 28	4:50 PM	Linked
PRESENTATION 29	5:05 PM	Adaptive Power Supply
PRESENTATION 30	5:20 PM	Hoover Dam Security Checkpoint
PRESENTATION 31	5:35 PM	Impact Solutions

Presentation Schedule

Project Title	Department
EE Team	Electrical and Computer Engineering
ial Gel	Mechanical Engineering
n Safety Rumble Strips	Civil and Environmental Engineering and Construction
	Interdisciplinary
	Computer Science
	Interdisciplinary
	Electrical and Computer Engineering
	Mechanical Engineering
ling	Civil and Environmental Engineering and Construction
	Interdisciplinary
	Computer Science
	Electrical and Computer Engineering
oint	Civil and Environmental Engineering and Construction
	Electrical and Computer Engineering

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING AND CONSTRUCTION PROJECTS

Department Chair
Dr. Donald Hayes

Senior Design Instructor
Dr. Douglas Rigby

Demand Responsive Pedestrian Safety Rumble Strips

Project Participants
David Morris, Kaulupono Perez,
Preetish Raj & Kay Van

Instructor
Dr. Douglas Rigby

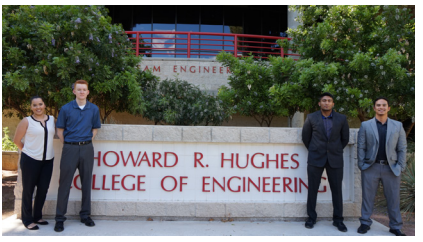
Faculty Advisors
Dr. Alexander Paz-Cruz
Dr. Barbara Luke

Technical Advisor
Dr. Ryan Sherman

Problem Identified
In the four-year span between 2011 and 2015, 330 pedestrians lost their lives and over 600 were injured on the roads of Nevada (NDOT, 2016). Specifically, from 2013 to 2016, the intersection at Harmon Ave & Paradise Rd has experienced 6 pedestrian injuries as a result of reckless and distracted driving, as well as drivers exceeding the 35 miles-per-hour speed limit.

Current Solutions
At the intersection in question, current countermeasures are limited to pedestrian signage and the statewide "hands free law". In general, two possible solutions to improve pedestrian safety while crossing the street include the Pedestrian Hybrid Beacon System and pedestrian signage. The Beacon system (HAWK) protects pedestrians by warning drivers using flashing lights and directing pedestrians when to cross the street whereas pedestrian signage warns drivers that there may be pedestrians crossing the street. Both solutions rely on the driver's ability to visually recognize the warning device.

Team's Solution
The Demand Responsive Pedestrian Safety Rumble Strips (DRRS) is an innovative technology that increases pedestrian safety while reducing distracted driving. The mechanism encompasses a concrete unit with retractable, steel strips laid transversely to the flow of traffic, which are activated by the push-to-walk button. The current solution(s) such as the HAWK focus on visual cues such as flashing lights while the DRRS focuses on physical cues (i.e. vehicle vibration). Visual cues such as flashing lights and signage may be overlooked by distracted drivers, but vehicle vibration due to this technology will rarely be disregarded. All pedestrians who use the crosswalk will benefit, as will older drivers and those with possible visual impairment.



Hoover Dam Security Checkpoint

Project Participants
Chas Gruber, Anthony Irizarry,
Nate Petersen & Juan Quezada

Instructor
Dr. Douglas Rigby

Faculty Advisor
Dr. Moses Karakouzian

Problem Identified
Hoover Dam is the most-visited dam in the world, counting some 7 million tourists a year. Following the terrorist attacks of 9-11, efforts to protect Hoover Dam, employees, and visitors were increased with a temporary security checkpoint. Shortly after its inception, the security checkpoint was determined to be a permanent necessity by the Bureau of Reclamation. The current condition of the security checkpoint has presented multiple problems. The existing queuing system is inefficient as it was not designed to accommodate large amounts of tourist traffic, which results in traffic lines frequently over a mile long. The current facilities present limitations to Operational Security (OPSEC) as they are inadequate for protecting workers and security equipment from harsh weather. Additionally, the security checkpoint is the first thing visitors see at the Hoover Dam and should therefore be more aesthetically pleasing in order to reflect its historical importance.

Current Solutions
The current solution would be to do nothing, leaving in place the current setup of portable booths, tents, concrete barriers, and traffic cones. This would not address any of the problems previously mentioned.

Team's Solution
The team's solution would be to design an improved security checkpoint with a greater number of queuing lanes and improved facilities. A permanent checkpoint facility will be designed with improved booths, additional restrooms, a proper HVAC system, offices, and a break room. This will improve security officer working conditions as well as allow for additional security equipment. A new traffic layout will improve traffic congestion, reduce wait times, and grant easier access to emergency vehicles. In addition, an improved entrance would promote tourism and reflect the historical importance and grandeur of the Hoover Dam.

LVB Light Rail

Project Participants
Steven Antra & Maria Evans

Instructor
Dr. Douglas Rigby

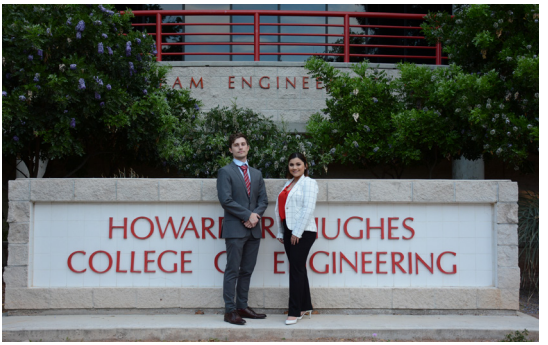
Faculty Advisor
Dr. Hualiang Teng

Community Advisors
David Swallow & RTC

Problem Identified
Currently, there is no direct connection between McCarran Airport, the Las Vegas Strip, and Downtown Las Vegas. This causes issues in mobility for tourists and people who wish to visit these main points of interest. Additionally, there is too much vehicle congestion on Las Vegas Boulevard due to added venues and tourist influx. There is a need for an environmentally conscious system which will simultaneously alleviate the congestion issue and provide a reliable connection to these main points of interest for its users.

Current Solutions
Current solutions include RTC's Deuce and SDX Public Bus Transit, the Las Vegas Monorail, taxis, Uber, and Lyft.

Team's Solution
This project aims to implement a high-speed transportation system in order to satisfy both the need for a connection through McCarran Airport, the Las Vegas Strip, and Downtown Las Vegas and relieve vehicle congestion. Unlike current solutions, the system will be able to serve a higher volume of users, will be more accessible, and will operate at quicker speeds – allowing its users to get to their respective destinations quicker and more efficiently. The beneficiaries of the system are the general public, including tourists and residents alike. Environmental factors will play a crucial role in overall design and green energy will be utilized to power the system. Likewise, pedestrian safety is a great concern, especially along Las Vegas Boulevard, and as such, pedestrian bridges will be included to promote safer conditions.



UNLV Paradise Campus Flooding

Project Participants
Alicia Qiu, Martha Rios,
Alexander Santiago, & Catherine Smith

Instructor
Dr. Douglas Rigby

Faculty & Technical Advisor
Dr. David James

Community Advisor
Peg Rees

Problem Identified

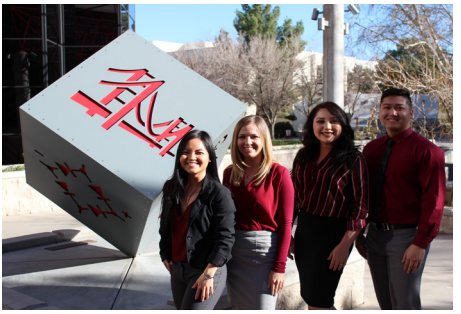
The Osher Lifelong Learning Institute (OLLI) located on the UNLV Paradise Campus, a program that provides retired or semi-retired individuals the opportunity to continue their education, experiences excessive flooding during rain events. Stormwater runoff from the surrounding area gets directed towards the Paradise Campus causing the earthen drainage channel, located on the south side of campus, to back up. The water then overflows onto areas that are used by faculty and students on a daily basis, such as the parking lot and the buildings.

Current Solutions

Currently, there are small drains behind each of the buildings and a narrow concrete-to-earthen channel that is supposed to convey flow off the property. The capacity of these drainages are insufficient to handle the amount of incoming runoff, so an easy-to-implement solution would be to increase its capacity. The existing medians in the parking lot were created to absorb water and reduce flooding, however the erosion and grading of the parking lot made the medians inessential and has caused accidents among the students.

Team's Solution

The team's solution is to redesign the parking lot so that it can properly redirect stormwater off the site to the storm drainage facility, while also refurbishing the currently eroded drainage channel into a channel with a higher capacity. After speaking with the director of OLLI and being able to meet with the members, the team also wanted to make the campus a more comfortable, safe and modern facility. To achieve this we will implement solar carports into the parking lot that will provide the students with shade during the summer, along with lighting at night, and electricity for the buildings. Other aspects of the design include increasing parking lot capacity and improving accessibility. All aspects of this renovation will be incorporated based on sustainable concepts that will provide both utilitarian and aesthetic improvements to the property.



DEPARTMENT OF COMPUTER SCIENCE PROJECTS

Department Chair
Dr. Laxmi Gewali

Senior Design Instructor
Dr. Ju-Yeon Jo

Custom Autonomous Secure Home (CASH)

Project Participants
Sean Baumchen, Joe Bickner, Brian Guerrero, Trevor Jacobson
Kaelan McIntosh, Darius Smith & Jonathan Young

Instructor
Dr. Ju-Yeon Jo

Problem Identified
Technology advances are resulting in many smart devices for the home, office, and personal use - some of these technological advances come as individual products or as complete packages, such as the Apple Watch, that revolutionized the personal digital assistant industry. In the area of home devices, automation advances have been made with individual products, most of which represent pieces of a complete home efficiency system. However, a major problem is that existing devices do not easily integrate to maximize efficiency of the user's home.

Current Solutions
Existing technologies are generally individual modules one for lights, one for thermostat, one for security requiring the owner to have three or more different applications all for home automation. While all these products are generally individual closed sourced systems, many do not integrate with a unique home system. Apple has developed the Apple home application, which is aimed to solving this problem by allowing different products be integrated together. However, many products do not meet the exacting criteria set forth by Apple, and thus a lower cost and easier to use alternative would be desirable.

Team's Solution
Our concept is to develop an application, which allows a user to integrate off-the-shelf home efficiency and security devices as these devices are purchased over time i.e. "plug and play". For example, if a particular device is purchased, the application user simply inputs the device manufacture's model number or manufacturing code and the application would integrate that particular device with other devices the user may have. The centralized home automation system consists of software with web applications, along with email, text messages, and phone alerts to communicate with home users regarding the status of their home. This system will be a universal central control center for the home; it will operate with multiple products over various communication methods. The system will allow for various modifications and is very adaptable in emerging technologies by utilizing friendly application programming interface protocols to allow for future expandability. This allows the system to have a long life span and to be continuously maintained.

Convention Logistics Tracker (CLT)

Project Participants
Steven Brooks, John Caoagas,
Wesley Dong, Demi He,
Nicholas Huynh, Lily Lei,
Jose Mendez & Grant Mercer

Instructor
Dr. Ju-Yeon Jo

Problem Identified
At any large convention, finding the right booth in a sea of exhibitors can be a difficult challenge for attendees. Mobile apps developed to alleviate this difficulty are usually out of date or are constrained by the Wi-Fi networks at the convention center.

Current Solutions
Paper maps currently dominate as the method of choice for convention navigation; though relatively cheap, these maps produce a lot of waste and are cumbersome to use in larger conventions. Alternatively, mobile applications suffice as an option but may suffer from spotty performance. Additionally, these applications are not reusable and often require considerable amounts of time to develop.

Team's Solution
The CLT suite provides two secure web portals for convention organizers and exhibitors, and a mobile app for attendees to download while at the convention. Convention organizers will be able to sign into the organizer portal, update convention information, scheduling, attending exhibitors, news articles, and more. Exhibitors who have registered with an organizer may then log into the exhibitor portal, and update their own information. This information may be accessed by convention attendees using the mobile app's easy-to-use interface. CLT sets itself apart from the competition with a scalable design, and strong focus on attendee satisfaction. In the case that conferences are more interested in developing a custom mobile app, information collected through the web portals is accessible via a public API exposed from the backend server.

FLTR "Filter" - Filterable Stock News Scanner

Project Participants
Daniel Asfeha, Cody Clymer, Joseph Copanas, Blair Davidson,
Juan Rodriguez, Joshua Sanchez, Aaron Sargento & Thomas Teren

Instructor
Dr. Ju-Yeon Jo

Problem Identified
For an entry level day trader, the stock market can be overwhelming, especially when trying to determine what stocks are in play for the day. One of the main problems our stock software will solve is the lack of leverage that the average day trader experiences. Thousands of press releases are published every morning and throughout the trading day that can be useful for making a trade. The way our software will benefit this user is by aggregating relevant press releases and news on-demand in an otherwise saturated and overwhelming sea of information.

Current Solutions
The two most popular current solutions to this problem are two pieces of software; Trade Ideas and Equity Feed. These programs have a news filter along with a much richer feature set but come at a cost ranging from ~$90 to ~$240 per month and are limited to the desktop platform.

Team's Solution
We are here to provide a real-time on-demand platform that gives our users the sought-after news filter feature like the solutions currently available. The upside with our software is that we will provide portability and affordability. The news filter will take the saturated stock news feed and give our users the articles that can potential yield a profit; providing much needed leverage to the average novice trader. Our goal with this project is to give the novice day trader a free/ low cost stock news filter and a companion mobile app to take advantage of the provided leverage on-the-go.

Linked

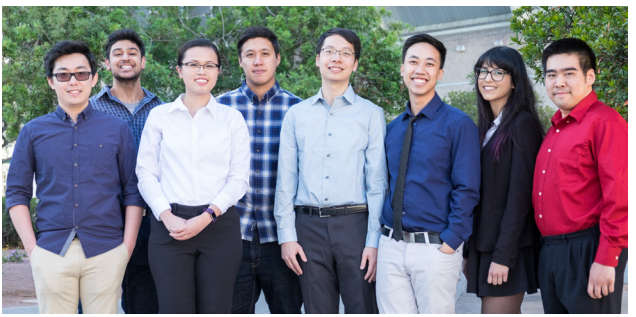
Project Participants
Danielle Caldeira, Kyle Chiu,
Jianwei Hu, Aditya Ingle,
Joy Lamug, Frankie Lui,
John Orenza & Anthony Paikai

Instructor & Technical Advisor
Dr. Ju-Yeon Jo

Problem Identified
Nowadays people don't have the time to meet new people in person, and some find it difficult to socialize. Almost everyone has a smartphone but no medium to make new friends in a casual setting without the restrictions that apps like Facebook put out. In summary, there are no applications that allow people to connect with others who have similar interests.

Current Solutions
The current solution to this is a web application called Meetup. It creates a specific time and date where people can join the meetup and go at that specific time.

Team's Solution
Anyone with a smartphone would be able to take advantage of this service. Our app would feature instant messaging, which will allow people to communicate in real time as opposed to having to exchange email addresses or phone numbers through the current web application solution. Additionally, our solution updates the user's location in frequent intervals so that everyone with the same interests can meet up anytime as opposed to specifying a time in advance. This would allow people to engage with one another spontaneously. Lastly, our app would also be beneficial to business owners who want to promote their services.



Spots

Project Participants
Dominique Angurano, Benjamin Cisneros, Alexies Fabian, Michael Ghisilieri, Randolph Huynh, Martin Jaime-Viveros, Derek Nhan & Jeung-Sook Williams

Instructor
Dr. Ju-Yeon Jo

Community Advisor
Tad McDowell

Problem Identified
Parking in a parking garage can be a time-consuming task. Especially when a lot is full, drivers must traverse the entire parking lot or garage in order to find available parking. Drivers are not able to scope the entire lot before entering to park.

Current Solutions
Existing solutions are very isolated such that they do not offer complete control and convenience to all users. Ticketing systems alone are able to maintain count and may even be able to register license plates at entry. Parking spot monitors are able to sense the vacancy of a spot and announce it to the immediate surrounding area for drivers near it. Camera monitoring systems are able to monitor an entire lot from above to create a map, and count vehicles by using image recognition. However, none of these systems offer a great benefit to the drivers.

Team's Solution
Spots will facilitate parking in parking lots with regular drivers by integrating all parking spaces on campus in a single system that will track parking spaces to notify and advise students and staff with important information about the parking spots on every lot.

The hardware system for Spots will consist of two components: a sensor and a card reader to create a post. It will then be placed at each parking space to require drivers to check-in to that particular spot. Parking posts will have simple notification lights to mark a parked vehicle as authorized/unauthorized. To sense unauthorized vehicles, the posts will also have parking sensors to be aware of parked vehicles that did not perform a check-in.

Spots includes a mobile app that will enable students and staff to monitor availability of spaces. In addition, the administrator app is also available to enable a parking enforcement department to have full administrative control over the parking system.

Note that Spots adds the aid to parking enforcement of monitoring parking in real time without the need to have a parking officer physically be present at each parking spot in order to verify if a vehicle is authorized to park. This application will allow parking services to collect detailed historical data to wiser decisions in terms of future parking development.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Department Chair
Dr. Yingtao Jiang

Senior Design Instructor
Brandon Blackstone

Adaptive Power Supply

Project Participants
Ronobir Das, Stephanie Silic,
Cassandra Williams & Jonathan Young

Instructor
Brandon Blackstone

Faculty Advisor
Dr. R. Jacob Baker

Problem Identified
In the age of the personal digital processors, an individual may have multiple portable devices, such as smartphones, tablets, and laptops, each with their own individual recharging requirements. It seems like every day there is a new battery charger needed to accommodate power hungry mobile devices. This can make travel or commuting to work with multiple devices an exercise in logistical planning because one must carry a unique charger for each personal device. A solution to this would be a universal charger, which accommodates all of the mobile devices.

Current Solutions
There are currently two battery chargers on the market that attempt to address this issue, they are the FINsiX DART and the Avogy ZOLT. While these first-to-market chargers are good at what they do, they currently do not support the full USB 3.0 spectrum which requires producing 20V*5A=100 watts of power. This is the key problem; laptop chargers have not been integrated into more portable and adaptable designs. When one gains the ability to use a single charger for multiple products, this leads to increased power efficiency and ability to accommodate more portable devices without carrying extra charging devices.

Team's Solution
At a basic level, our solution is a charger that operates to the highest USB 3.0 standard to allow for the charging of multiple devices with varying power ratings and charging requirements. We have designed a charger that can be used for a range of devices and meets a higher power profile than the competitors mentioned, and we have done this at a lower cost than the available market solutions. That means our design is a forward-looking device charger, supporting the power requirements of future devices as well as a wider range of present devices. Anyone who has a need for an adaptive or universal device charger will benefit from this kind of solution.

Card Shoe Projection System

Project Participants
Manuel Degracia, Kyle Ebuen
& Russ Prado

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Brendan Morris

Community Advisor
Dr. Daniel Sahl

Problem Identified
In any type of gaming where odds are in play, whether it be popular games like blackjack or baccarat, players always try to find a way to increase their chances of winning. Edge-sorting is a card reading technique in which skilled players observe and exploit the natural, subtle irregularities on the backside of playing cards. Using that information, players can then determine the probability of a card value at a higher rate. Due to this type of advantage play, the odds for casino card games change significantly in favor of the player.

Current Solutions
Casinos now employ different prevention methods to hinder players from edge-sorting. The most commonly implemented methods are a sliding gate which covers the next drawn card, automatic card shufflers and a fading print of the pattern found on the backside of playing cards. However, when utilizing these types of methods, casinos notice a decrease in dealer efficiency and games played per hour due to the multiple steps needed for each technique. This ultimately decreases a casino's potential profits in table card games.

Team's Solution
Our objective is to create a marketable product that can be used to assist casinos and businesses in hindering players from using advantage play, specifically edge-sorting. Using light manipulation, our team has designed a card dealing shoe projection system that can render an image or pattern onto a card. With this concept, we can effectively obscure the card pattern irregularities of the next card drawn in a card shoe. Since our design uses light as a medium instead of physical components, we not only hinder edge-sorting, we also help maintain the natural card drawing motions of a dealer. In addition, because our design will be an add-on to a standard 8-deck card dealing shoe, casinos can use it with their pre-existing hardware making it a cost-effective alternative.

Casino Dice Project

Project Participants
Rodolfo Gutierrez, Calvin Suratos
& Melvin Suratos

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Yingtao Jiang

Community Advisor
Dr. Daniel Sahl

Technical Advisor
Dr. Venkatesan Muthukumar

Problem Identified
Find a better way to play casino dice games. The difficulty in achieving this is to add electronic components into a 19mm3 dice and molding the dice around the circuit. In addition, we have to make it cost-effective and battery efficient.

Current Solutions
Currently there are LED dice and self-rolling dice which serve has a proof of concept for the current design. These dice however do not innovate or create any new casino games. The goal for these dice is to allow for more gaming possibilities.

Team's Solution
Our solution with the advice of Dr. Sahl's proposal was to have flashing LED dice that randomly settle on a specific color once rolled. This can drastically change the possibilities for casino games. It is battery efficient and will be able to fit in a standard casino dice. Furthermore, we are designing these dice to be cheap when mass produced. Current casinos can benefit from innovating current dice games by attracting customers to play with this added feature. Plus, the customers can enjoy a new version with playing dice games.

Impact Solutions

Project Participant
Andrea Aldana, Wale Gebre
& Co Nguyen

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Biswajit Das

Problem Identified
Football is one sport out of many where a player is hit, and to protect them they wear multiple protective gears, one of them being a helmet. However, even by wearing helmets, there is still a chance that they can suffer a concussion when they are tackled. During a game, if a player is hit with a large force and have a difficult time standing up, they are taken back to the locker room to go through multiple testing. However, players are still put on concussion watch, with or without a concussion to be on the safer side.

Current Solutions
Currently, when a player is hit, they are removed from the game and undergo concussion protocol. Even if the hit isn't strong enough for a player to suffer a concussion they are still required to do protocol. However, there are some players who ignore the pain, and continue to play which puts them at risk for future head injuries.

Team's Solution
The purpose of our project is to detect the level of force when a football player is hit. If a collision between players is large enough to lead to a concussion, we want to track it. Our helmet currently has: accelerometers to measure the force, lights to detect if the player is in the safe or danger zone, and can wirelessly transfer data when the game is live. This will help coaches, and medical teams to track which players suffered a large impact, and will be able to remove them from the game immediately. Players will not have the option to stay, because the data will show the amount force he took, which will benefit him in the long run in avoiding any head injuries.

Micro Grid II: Controls and Revisions

Project Participants
Dominique Anduiano, Sergio Covarrubias,
James Garner & Anelito Vargas

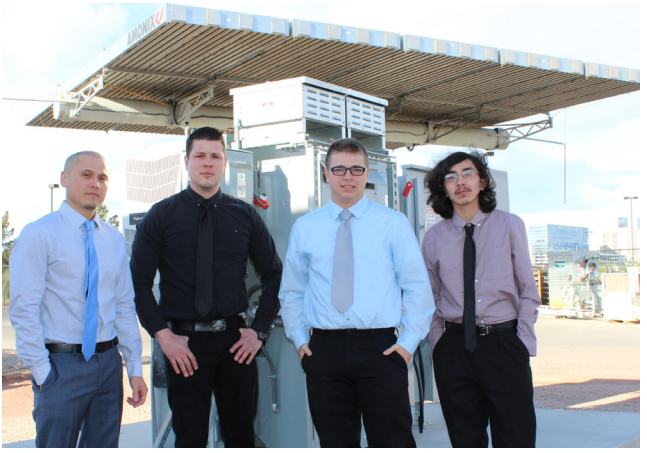
Instructor
Brandon Blackstone

Community Advisor
Octavio Gonzalez

Problem Identified
The micro grid is currently working off a non-uniformed system which under certain circumstances, can fail due to a shutdown from NV Energy. Other safety systems can be put in place to further increase the longevity and safety of both the project and any students who work on it.

Current Solutions
Conversion to a 24V DC system which includes a battery backup system for the controls allows maximum efficiency and versatility to the project. Many revisions, to include revision of the generator and conversion of programmable devices were needed to convert to a 24V DC system. Further implementation of the control scheme will allow the devices to operate with minimum risk.

Team's Solution
Our solution is better than current solutions because it provides the ability to completely run the Micro Grid without the electrical grid. It will benefit the students on campus, the project itself can further develop under this system and we hope it benefits power companies in the future with potential research being done.



Micro Grid II: Load Share

Project Participants
Kyle Deignan, Chandon Esplin,
Michael Ghisilieri & Kristofer Segler

Instructor
Brandon Blackstone

Community Advisor
Octavio Gonzalez

Problem Identified
The rise of renewable energies, in both energy production and storage, has altered the landscape of supply and demand. Longstanding methods of reliable energy production and stable distribution must now adapt to interface with distributed resources that are able to operate autonomously and on-demand. The challenge then becomes optimizing the coordination of each source contained within the micro-grid to operate reliably under the many adverse conditions that may arise.

Current Solutions
The implementation of micro-grids, and more specifically, the allocation of distributed resource generation within the micro-grid, must be done on a case by case basis.

Team's Solution
The rapid development of, and demand for, cleaner energy solutions has created unknowns in the future operation of electrical utility grids. The addition of load share controls and optimization is essential to a fully realized/autonomous micro-grid. This modular design allows micro-grids to scale as needed and utilize any available resource per location. This flexibility will prove beneficial for large scale or individual operated Micro-Grids.

The Electrical Tester

Project Participants
James Mellott, Eric Monahan
& Isaac Robinson

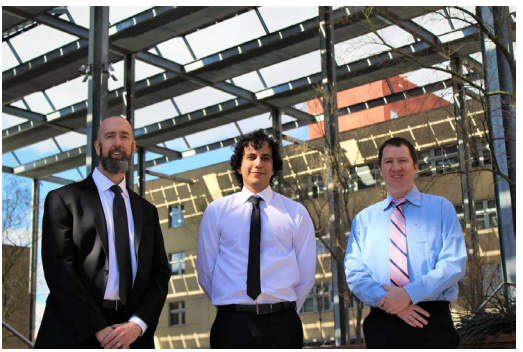
Instructor
Brandon Blackstone

Faculty Advisor
Dr. R. Jacob Baker

Problem Identified
The risk of electrical shock from working with electrical circuits that could potentially become live is a major concern for both individuals and employers operating in the high voltage A/C electrical field. In the event of an accident, information regarding the details of the accident is critical in preventing future accidents. There are currently no existing detection devices that record any information of the events prior to an accident occurring.

Current Solutions
On the current market, there are no devices with memory providing passive detection of live A/C circuits. The detection devices currently on the market require active use for immediate detection, but do not continuously record live A/C circuit detection data.

Team's Solution
The Electrical Tester offers passive detection to alert the user immediately if they are working in the vicinity of a live circuit that could potentially cause electrical shock. Our design is intended to protect individual users, employers, and employees. To protect the employer, our design implements memory to record the detection of a live circuit as well as offering immediate detection to prevent damage to equipment. The recorded data can be used to provide more information on the events prior to an accident. To protect the user/employee, our design offers passive detection to alert the user immediately if they are working in the vicinity of a live A/C circuit that could potentially cause electrical shock or worse.



Universally Expanding Cage – EE Team

Project Participants
Derek Nhan, Allan Pineda,
& Frank Sanchez

Instructor
Brandon Blackstone

Faculty Advisors
Dr. Emma Regentova &
Dr. R. Jacob Baker

Community Advisor
Dr. Thomas Grotz

Problem Identified
We attempt to automate the Universally Expanding Cage originally designed by Dr. Thomas Grotz. The original design was manually adjusted and our solution will allow the doctor to adjust the device without the need of additional surgery.

Current Solutions
The current market solutions are the Tria C brace and bone fusion. The former is a brace that is worn outside the body. The bone fusion is done with a metal rod that is implanted through surgery. Both of these solutions have their pros and cons.

Team's Solution
Our solution seeks to improve the convenience of the current solutions. The Tria-C brace can only be worn outside the body, which is convenient since no surgery has to be performed. The device, however, can intrude in everyday life as it will require the patient to adjust the brace and remove it when doing physical activity. The bone fusion, which involves the metal rods being implanted in the body, can be risky as the area can become infected or inflamed. Patients also need to go through repeated surgery to adjust their device. Our solution will provide the ability to be discrete and flexible after initial surgery. The patient can adjust the device when needed and will allow them to live their life normally.

DEPARTMENT OF ENTERTAINMENT ENGINEERING & DESIGN PROJECTS

Department Chairs
Dr. Rama Venkat
Dr. Joe Aldridge

Senior Design Instructor
Dr. Si Jung Kim

The Hi Ball

Project Participants
Kalewalani Bancaco, Kevin Brekke,
& Tabitha Engle

Instructor & Faculty Advisor
Dr. Si Jung Kim

Problem Identified
The problem we are addressing with the HiBall is the disruptive and time consuming act of taking photos and selfies during various entertainment activities. Entertainment is a huge industry that often demands large venues with seas of people gathered around a single stage. We are focusing on events where you normally see beach balls being tossed around for crowd interaction. It is currently very difficult to capture hands free photos and videos of you and your friends during these types of entertainment events. Another problem seen at these events, is the loss of crowd interaction and participation. Patrons in the back never get to see themselves on the stage with their favorite artists.

Current Solutions
Based on our literature review, we found the HP Photoball to be the best solution so far. While the products' concept and goal is similar to ours, the quality of photo and video streamed is very poor. Other solutions would be existing selfie sticks, the Panono, and drones with self-balancing gimbal technology. These current products do not meet the needs of our prospective market because they either need to be constantly handheld, output low quality photo and video, or are too expensive. The HiBall provides solutions to all of these specifications.

Team's Solution
The HiBall is a beach ball inspired housing for a mini action camera like the GoPro Session 5 or the Polaroid Cube. Using adapted gimbal technology and custom fabrication, we have elevated and repurposed the experience of tossing beach balls into a crowd. Audiences of various entertainment venues, musical genres and sporting events will enjoy passing around the HiBall to see themselves on the big screen while having access to quality photos and videos of themselves to remember these events forever.

Currently, the video that the HiBall live streams and records is sent to a cloud where patrons can view the footage captured and choose the exact moments they would like to save and share. Eventually we would like to integrate a network where anyone who connects to the HiBall through a wifi network will be able to capture the video and still images under their own control. For those massive entertainment venues that host festivals, sporting events and concerts, the long range, live stream capability of the HiBall provides a way for every person in the crowd from the front row to the last, to feel included on the main stage. This encourages audience interaction and overall enjoyment for the entire crowd. Other applications of the HiBall may include capturing memories at parks, school functions, pools, lakes, beaches, and other social events.

DEPARTMENT OF MECHANICAL ENGINEERING PROJECTS

Department Chair
Dr. Brendan O'Toole

Senior Design Instructor
Dr. Zhiyong Wang

Bombyx Mori Silk Antimicrobial Gel

Project Participants
Corey Malinowski & Alexander Szepelak

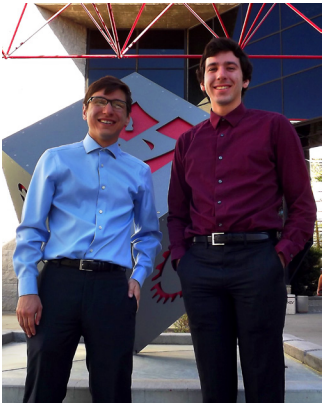
Instructor
Dr. Zhiyong Wang

Faculty & Technical Advisor
Dr. Hui Zhao

Problem Identified
Doctors and surgeons encounter many foreign contaminants and diseases while in contact with patients or performing surgery. Certain viruses, such as the more recent Ebola Virus, are highly contagious causing many healthcare workers to have contract the virus. Also, hospital-borne illnesses are some of most severe and dangerous. Thus, there is a need for an additional layer of protection for hospital workers, doctors and surgeons.

Current Solutions
The current solution is to use medical masks and gloves while taking steps to ensure protocols are followed during their work day.

Team's Solution
The team proposes a gel made of Bombyx Mori silk, or silkworm cocoon silk, mixed with an antimicrobial agent, like silver nanoparticles. This will be used to cover a medical mask or gloves to add an additional layer of protection from bacteria and viruses, killing them off so that they do not remain alive on the doctor or hospital worker's gloves or mask. The gel will be biodegradable and biocompatible so that it will not be harmful when thrown away and safe to meet a person's skin. In high-pressure situations, where small errors in sanitization may occur and infections could be spread, the gel will protect the practitioner from the harmful contaminants. This will be a major step in improving the safety of hospital workers and doctors.



Coanda Quadcopter

Project Participants
Kevin Briggs, Angelica Rodriguez
& Victor Quintanilla

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Woosoon Yim

Problem Identified
The Unmanned Aerial Vehicle (UAV) industry is projected to steadily grow in the upcoming years. The projected growth is attributed to large organizations, like Amazon, looking to adopt UAV technology for tasks such as package delivery. The main challenge preventing the commercialization of UAV's is their short flight times. The problem is exacerbated when additional features and payloads are added to allow such drones to perform useful tasks.

Current Solutions
Currently, the flight time issue is being addressed along two avenues. First, the battery capacity is being increased, but the larger batteries increase both the UAV's weight and cost. Secondly, combustion propulsion systems have been implemented in military applications. However, this solution considerably increases the cost of the drones and adds to the technology's carbon footprint.

Team's Solution
Our team's solution to the flight duration problem involves adding an additional means of generating lift without significantly increasing the cost or weight of the UAV. This was accomplished by using a generic quadcopter design and integrating a lightweight reinforced 3D-printable surface to function as a radial airfoil. The surface, known as a "Coanda surface", is similar to an airplane wing and takes advantage of a fluid dynamic phenomenon known as the "Coanda Effect". Simply stated, the redirection of the flow from the propellers across the surface will result in a lift producing pressure gradient. This means of producing lift does not come at the cost of additional motors, batteries or other costly components nor is the carbon footprint of the technology increased. We feel that the incorporation of this concept will improve the technology's market potential.

Damping System Test Drop Tower

Project Participants
Jessica Cole, Zachary Frank,
Sara Williams & Isaac Wilson

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Douglas Reynolds

Technical Advisors
Terry Kell & Jeff Markle

Problem Identified
Small marine crafts experience impact shocks when they contact the water after cresting a tall wave at high velocities. This can cause serious injuries for people within the marine craft. Damping systems for marine craft seats have been developed to address the problem but there are limited methods in which to test the efficacy of the system by means of simulating a drop from a wave crest.

Current Solutions
Two similar towers exist today to test the damping systems but one is in Europe and the other is in Washington D.C. which are both out of the reach of people who wish to do such testing here in Las Vegas, Nevada. The two towers have different designs which enable them to simulate varying ranges of shock with varying amount of control. However, the length of the shock the tower can generate is typically short.

Team's Solution
Our solution involves a tower that is able to generate a wide range of shocks into a damping system with a large amount of control while allowing the system to be interchanged with others. It will be able to generate longer shocks at a wider range than current designs and will be easily customizable. Appropriate components can be modified to allow for the changing of testing conditions, increasing the applicability and overall usefulness of the testing apparatus.

Harco Spray Gun

Project Participant
Brandon Winkel

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Darrell Pepper

Problem Identified
Harco Americas requires a dual nozzle spray gun design for spraying a two-component waterproofing solution. It needs to be cheaper, lighter, simpler, and easier to handle than the current solution.

Current Solutions
Harco uses an existing spray gun with a proprietary machined part. It is constructed of aluminum and is pneumatically actuated. It is approximately 3 lbs and has a number of specific requirements based on how the emulsion is sprayed.

Team's Solution
The redesigned gun improves ergonomics while reducing weight by 1-1.5 lbs due to the use of plastic instead of aluminum. It meets pressure requirements while making it easier for the operator to use with less fatigue over long periods of time. Cost per gun is reduced due to using the plastic and through a reduction in the number of parts used. This reduces downtime by making the gun easier to tear down and clean in the field.

Jox-T

Project Participants
Darryl Corniel & Liza Vernon

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Brendan O'Toole

Problem Identified
Baseball practice usually involves the hitter and coaches recollecting the used balls after a round of hitting. This can become time-consuming and cut into practice time as well as be a burden since the weather outside needs to be ideal. The Jox-T will become a cheap solution to both of these issues while involving precise swings through the strike zone.

Current Solutions
There are many products already in this market, some dating as far back as the 1920s when baseball was most popular. Similar products often involve the use of tees with nets or a nonmoving ball mounted on a base. These solutions allow players to work on their swing but are often too bulky for indoor use or require the baseballs to be recollected.

Team's Solution
The idea of this tee is to have the hitter work on getting their bat head through the zone to make full contact with the ball while involving no recollection of the hit ball. The elastic string fastened to the frame of the tee keeps a ball suspended for the hitter to repeatedly strike during practice until it is ready to be changed out. This design is made to be used both indoors and outdoors while being mobile and easy to assembly or change out if the suspended ball/cord is damaged. The main objective of the prototype is to allow for proper training of hand-eye coordination but involving a more efficient practice due to less time shagging baseballs and more time hitting.

Project Apollo: Automated Heliodon V2.0

Project Participants
Nicolas Michel, Trung Nguyen,
& Arnulfo Sadang

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. David James

Technical Advisor
Terry Kell

Problem Identified
There is a lack of simple, user-friendly heliodons (devices for simulating the position of the sun) for architectural models on the market. Most are outdated and do not take advantage of modern technology, requiring user calculations and control, as well as being large and expensive.

Current Solutions
Commercially available heliodons are expensive and require manual control and calculation. They are complicated to use and require training to operate.

Team's Solution
Our goal is to modernize this technology with simple control systems and a user-friendly interface. Our compact and inexpensive design would be more accessible for architectural firms and educational institutions. Critically, the automated controls allow users to more directly execute their goals without calculations or extra work. This new system is more time-efficient and requires less training.

Universally Expanding Cage – ME Team

Project Participants
Victor Carbajal & Derek Ta

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Brendan O'Toole

Technical Advisor
Dr. Thomas Grotz

Problem Identified
The human intervertebral disc deteriorates over time due to aging or any internal injury to the vertebrae. When deterioration occurs, the nucleus pulposus and annulus fibrosis that reside in the disc lose their "gel like elastic structure." This can lead to a range of injuries, such as putting pressure on the spinal cord, or vertebrae coming into contact with each other causing excruciating pain for the patient.

Current Solutions
Currently, there are many bio-mechanical devices that solve the defined problem by correcting the loss in height and aiding in the fusion of the vertebrae. Most of the currently available devices in the market have to be custom made to that particular patient. There are also existing devices that can expand to meet the patient's individual spinal problem. However, the existing devices only expand selectively either the posterior or lateral portion of the vertebrae.

Team's Solution
The Universally Expanding Cage (UEC) can expand in height just like the existing devices, but the UEC can simultaneously expand both laterally and posteriorly. The UEC is implanted in between the vertebrae and expanded laterally and posteriorly as needed to fix the spinal alignment. The area is then filled in with bone grafting material while the spine is held in place by pedicle screws attached to the facet joints. The UEC offers more versatility than the existing devices in the market. The UEC benefits patients with scoliosis, degenerative disc disease (DDD) or spinal deformities while benefiting hospitals by universally adapting to any patient instead of having to be custom made.

Wastewater Evaporator

Project Participants
Srdjan Bosnjak & Austin Rising

Instructor
Dr. Zhiyong Wang

Faculty Advisor
Dr. Yi-Tung Chen

Problem Identified
Power plants produce a large amount of wastewater that leads to a containment issue. Methods of removing the wastewater are often too costly or prevented by the governing environmental authority.

Current Solutions
Variations of increasing oxygen interaction with the water are used currently. Systems like aerators, fountains and snow blowers are used to reduce the load of continuous water spoilage produced by the power production process. Other costly and last ditch efforts include physically trucking the water to other locations or using complex filtration systems to separate contaminants from water.

Team's Solution
The Surface Evaporator is an economical approach to providing a low-cost evaporation solution to EPA regulated counties across the United States. The developed system reduces high initial and running cost by subsidizing large power requirements, commonly used in other evaporation solutions, by harnessing solar energy to increase the rate of evaporation. The proposed solution optimizes fluid flow into monolayer film across a heat conductive surface. Spreading the water across a heat conductive surface, will in combination, maximize aeration through increased area of water and air contact as well as allow for energy transfer through convection, effectively raising the evaporation flux. With low power requirements and compact features, the wastewater evaporator provides a suitable option for power plants that demand additional evaporation support.

INTERDISCIPLINARY PROJECTS

Accurate Photon-Emitting Liquid (A.P.E.L.) Scan

Project Participants
Tyler Huddleston, Sesomphone Lim,
& Raheel Sadiq

Instructor
Brandon Blackstone

Faculty Advisor
Angsuman Roy

Problem Identified
The current problem is that medical bacteria scanners are not accurate enough to detect small quantities of bacteria. Small populations of bacteria undetected by these scanners could then reproduce into large harmful ones. The intention of our project is to develop a device that will detect levels of bacteria at earlier stages and more accurately using a more sensitive sensor, the Silicon Photomultiplier (SiPM).

Current Solutions
Current devices use less accurate sensors – CMOS imagers, which are used as the sensors for digital cameras. These sensors only detect large amounts of bacteria present in a sample, meaning that smaller amounts go undetected.

Team's Solution
We also take advantage of CMOS technology with a SiPM fabricated on a chip that requires much less power than traditional ones. Our device detects and counts photons emitted from a liquid. Our intended application for it is to determine the amount of bacteria present in a blood sample, where the bacteria are stained with a fluorescent dye.

Carpal Tunnel Relief Massager

Project Participants
David Hunt, Davis Nguyen,
Staford Snow & Marques Thompson

Instructor
Brandon Blackstone

Faculty Advisor
Dr. Venkatesan Muthukumar

Community Advisor
Skip Haas

Problem Identified
Carpal tunnel affects over 3 million Americans every year. Current methods of relief are expensive and/or ineffective.

Current Solutions
Surgery only has a typical success rate of 43% and requires additional surgeries to remove scar tissue. Physical therapy is another, less risky, solution but requires consecutive sessions for continual relief.

Team's Solution
Our team's solution is to build a device that mimics the actions of a physical therapist so clients can have consecutive sessions without a doctor visit.

Hailey's Hand V3.0

Project Participants
James Maliniemi & Yosemit Xolalpa

Instructor
Dr. Zhiyong Wang

Faculty & Technical Advisor
Dr. Brendan O'Toole

Problem Identified
Prosthetics are often some combination of: expensive, limited in scope, limited in capability and limited to adult use. No wearable prosthetic is reasonably priced, designed for a child, has a wide range of motion, and addresses the specific case of missing fingers rather than a missing hand or forearm.

Current Solutions
3D printed prosthetics are cheap and many address at least one part of the above identified issues. None address every problem.

Team's Solution
Hailey's Hand 3.0 addresses the identified problems, and either improves upon, or expands the scope of, previous Hailey's Hand Designs. Namely, the hand is properly scaled, has a range of motion for each finger, is computerized, and utilizes EMG control via wearable electrodes.

Silicon Photomultiplier High Energy Radiation Detector

Project Participants
Michelle Chiu, Dominic Hryciuk,
Sally Lee & Brandon Wade

Instructors
Brandon Blackstone &
Dr. Zhiyong Wang

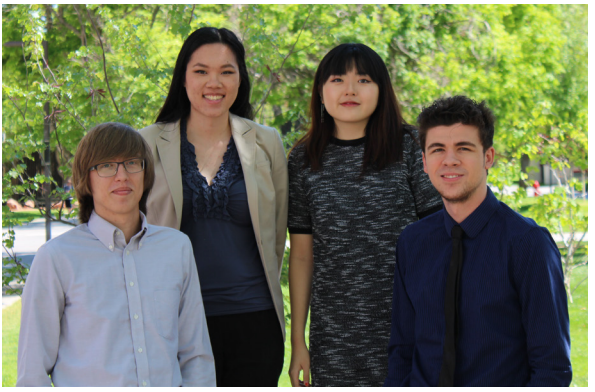
Faculty Advisors
Dr. R. Jacob Baker, Dr. Jaeyun Moon
& Dr. Emma Regentova

Community Advisor
Angsuman Roy

Problem Identified
Scintillation counter devices are used in nuclear medicine (gamma camera, positron emission tomography, etc.) and to detect environmental radiation.

Current Solutions
Current scintillation counter devices on the market are not utilizing the silicon photomultiplier (SiPM) as a standard detector. Thus, they are not as efficient and cost effective as they could be. Most are not only bulky, but also limited in application.

Team's Solution
Our solution will utilize an in-house designed SiPM that will greatly reduce the cost of a scintillation counter device. The design will aim for interchangeable parts that allow users to change the scintillator easily for different applications. The finished product should benefit any field needing a cost-effective radiation detector. Examples include the medical field, researchers and radiation safety personnel.



Z-Med Alert

Project Participants
Nicholas Banas, Mari Gilligan,
Alex Hoffman & Luke Olsen

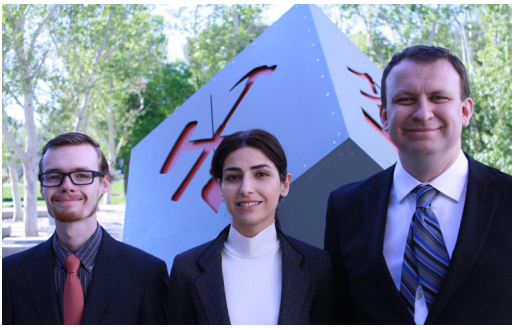
Instructor
Brandon Blackstone

Faculty Advisor
Dr. Evangelos Yfantis

Problem Identified
As world healthcare advances, the population of the world is gradually getting older. For many of these older individuals independent living remains a major goal. However, even with modern conveniences, accidents remain a major concern for seniors living alone. The ability to rapidly communicate emergency situations to those who can provide assistance is key to bringing independence back to these individuals.

Current Solutions
Life Alert first came to the market in 1992 and has strong brand recognition. Their product has a $70/month service charge, 10-year life, GSM connectivity and GPS. ADT is newer to the market, but has a business tie in with its home protection services. Their solution has a $40/month service charge, 24hr battery life, GSM connectivity and GPS, but requires a mobile base unit as well.

Team's Solution
Z-med Alert attempts to balance all the features of the current market products by using newer technology at a significantly reduced cost. The current solutions rely on the GSM network that all major phone companies will have shut down by 2018, making the units obsolete. Z-med Alert uses the current Bluetooth 4.2 low power long range standard to connect with the user's cell phone for its communication needs. This allows our device to be mobile, have a 5-year battery life and eliminates the need for a monthly service fee. We hope that with this product even those seniors that are living on a fixed income can live a fulfilling independent life while having the security of knowing that help is just a button push away.



Competition Notes

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Associate Dean of Research, Graduate Programs and Computing

Dr. Mohammed Trabia
Associate Dean, Undergraduate Programs

Dr. Georg Mauer
Chair of Computer Science Department

Dr. Laxmi Gewali
Chair of Civil and Environmental Engineering and Construction Department

Dr. Donald Hayes
Chair of Electrical and Computer Engineering Department

Dr. Yingtao Jiang
Chair of Mechanical Engineering Department

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