Final Program

4th Annual USF College of Engineering

Undergraduate Research Symposium

Thursday, April 6th 2006

Hall of Flags

12:30-4 pm

(Poster set-up starts at 11:00 am)

Table of Contents:

Schedule of Events on April 6th:

11:00 AM - 12:30 PM	**Poster set-up in Hall of Flags** (all participating students help moving the tables out of the way and set-up easels and posterboards)
12:30 PM – 2:00 PM	**Poster Presentations and Judging** (Several groups of judges will visit the posters and enjoy the student's presentations)
2:00 PM – 2:45 PM	**Arranging Hall of Flags for Awards Ceremony** (all participating students please help rearranging the tables)
2:45 PM – 3:00 PM	**Group Photo** (will be taken outside the Hall of Flags)
3:00 PM - 4:00 PM	**Awards Ceremony** Presentation of Winners (**Cash prizes for winners**) **Pizza&Drinks for all Participants after Award Ceremony**

I. Abstracts

1. Chemical Engineering Abstracts:

Poster#: ChE.1

NANOCOMPOSITE-TYPE ZEOLITE APPLICATIONS FOR POLYMER ELECTROLYTE MEMBRANE FUEL CELLS

Aaron Black, Amanda Gannon, Dr. John T. Wolan*

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Funded by the Department of Energy

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In order to increase conductivity, reaction kinetics and resist catalyst poisoning, there is interest in increasing the maximum operating temperature of a polymer-based proton exchange membrane fuel cell to 120-150 ºC. One approach to increasing operating temperatures, while maintaining optimal water retention, is the incorporation of nanoparticles into the electrolyte membrane. In this work, a _-zeolite nanocomposite, protonated membrane is investigated for fuel cell operation at elevated temperatures. The _-zeolite nanoparticles as well as the nanocomposite membranes were analyzed at several steps in the manufacturing process using X-ray photoelectron spectroscopy and will be presented together with performance data.

Presenting author short bio: Aaron Black is a Tampa, FL native. He graduated from Jesuit High School and completed 1 year of undergraduate studies at Brigham Young University before transferring to the University of South Florida. While at USF, Aaron has been working as an REU research assistant in the Applied Surface Science Laboratory, under the direction of Dr. John T. Wolan, for almost 3 years. There, he has done research involving XPS and AES characterization, Gas Chromatography, PEM fuel cells, partial oxidation reactions, and PEM membrane design/fabrication.

Presenting author's plans for the future: After graduating with a BS in Chemical Engineering, Aaron plans to pursue a MS in Chemical Engineering and continue research and development in the rapidly growing fuel cell industry.

Poster#: ChE.2

Diffusion Cell Fabrication for Oxygen Diffusion Characterization

Justin Dodson[#], Dr. Venkat Bhethanabotla[#], and Dr. Rajan Sen[*]
Department of Chemical Engineering[#] and Department of Civil Engineering[*]
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A specially designed diffusion cell quantifies the oxygen concentration inside the cell by using an oxygen sensor. Fiber reinforced polymer (FRP), the membrane, is positioned between two stainless steel chambers with o-rings sealing the membrane to the chambers. The receiving chamber contains a negligible amount of oxygen and the sensor while the other chamber remains open to atmospheric oxygen concentration, 21 percent. The sensor measures a voltage corresponding to an oxygen concentration. A quasi-steady-state diffusion model based on Fick's Law along with sensor consumption and an o-ring leakage factor will be used to determine a diffusion coefficient. The diffusion coefficient expresses the oxygen ingress through the membrane.

Presenting author short bio: Justin Dodson grew up in Saint Petersburg, FL. He was a graduate of Lakewood High School in Saint Petersburg, FL.

Presenting author's plans for the future: He is pursuing a Bachelors degree in Chemical Engineering. After he graduates, he plans to work as a process engineering at manufacturing company.

Poster#: ChE.3

Investigation of Biomechanical Influences in Aortic Valve Tissue

John Elliott, Michael D. VanAuker, Joel A. Strom, Anna Plaas

University of South Florida Department of Chemical Engineering/ College of Medicine, Department of Internal Medicine

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Background: The aortic valve is composed of distinct tissue layers which undergo complex biomechanical interactions in response to pathological processes such as in degenerative aortic valve disease. Characterization of these interactions will aid in understanding disease progression and would be key to the development of treatments to halt or reverse disease.

Methods: We developed an ex-vivo tissue culture technique incorporating agarose bedding for stability. Porcine aortic valve leaflet tissue was cultured for a total of 7 days at 37.5ºC with 5% CO_2 and atmospheric pressure. Samples were processed for biochemical analysis (and frozen at -80ºC), and for histological analysis (and fixed with 70% formalin). Fluorophore-assisted-carbohydrate-electrophoresis analysis was used to examine the glycosaminoglycans present in the tissue. Histological analysis involved traditional hematoxylin and eosin staining to elucidate physical structure.

Results: We confirmed that this process maintains tissue viability, and initial biochemical analysis indicates synthesis of glycosaminoglycans.

Conclusion: These techniques will be used to investigate the response of aortic valve tissue to different biomechanical stimuli. This approach can help elucidate the biomechanical factors in aortic leaflet degeneration.

Presenting author short bio: John Elliott grew up in rural Virginia. He attended high school in Lenoir North Carolina at the Patterson School.

Presenting author's plans for the future: John Elliott is currently pursuing his masters' degree in Chemical Engineering with plans to complete his PhD and continue research in the cardiovascular field.

Poster#: ChE.4

Using an Extract of Nopal Cactus to Remove Contaminants and Heavy Metals from Water

Mónica J. Escobar, Kevin A. Young, Norma Alcantar

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Several rural areas and small towns around the world have had problems with non-potable drinking water available for their communities. For this reason, there has been a boom in the scientific community to research new alternatives by applying "green technology". Our purpose is to study the characteristics and behavior of the common Nopal Cactus to determine if this will help to clean the water of a rural community in Mexico. The main idea is to utilize the flocculating abilities of the cactus mucilage to develop a natural filter. Our results demonstrated that it can reduce the concentrations of contaminant particles and arsenic from the water. The techniques used for these analysis were light scattering and hydride generation atomic fluorescence spectrometry. This multidisciplinary research has offered a more optimistic, pioneer, and reliable perspective of using natural occurring flocculants that are economic, safe for the environment, and abundant in the region.

Monica J. Escobar grew up in Bogota, Colombia-South America. She came to the United States six years ago to enhance her academic opportunities. Monica graduated Magna Cum Laude from Countryside High School. As an REU she is assisting three graduate students in their research projects, that goes from the green chemistry to the biomedical engineering. Monica is a member of the American Chemistry Society (ACS), American Institute of Chemical Engineers (AIChE), Marketing Network Society (USF), Director of Publicity, Engineering EXPO 2005-2006 (USF) and a Tau Beta Pi Initiate. Besides, she presented her REU research in the National Conference of the American Institute of Chemical Engineers (AIChE), Cincinnati-OH (2005).

Monica aspires to finish a Bachelor of Science degree in Chemical Engineering and complement it with a Master of Science in Engineering Management at USF. She is planning to do an internship in the cosmetic industry or in a flavors and fragrances company. Some of her professional interests include food processing and engineering, pharmaceuticals, cosmetic science, and perfumery.

This project provide fundamental, quantitative insights into the necessary and minimum requirements for natural flocculating agents that are innovative, environmentally benign, and cost-effective.

Poster#: ChE.5

Development of Biodegradable Microspheres to Release Anti-Inflammatory Drugs around Biosensor

Nuvala Fomban[1], Yvonne Moussy[2], Francis Moussy[1]

[1]Chemical Engineering and [2]Mechanical Engineering

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The objective of this work is to develop polylactic-co-glycolic Acid (PLGA) microspheres for continuous delivery of an anti-inflammatory drug (dexamethasone) for over a determined period of time. These microspheres will be used to suppress the acute and chronic inflammatory reactions to implanted glucose biosensors. The microspheres were formulated by an oil-in-water emulsion technique and the size of 200 microspheres was estimated by NIH scion imaging. The microspheres were successfully fabricated and their average diameter was 45 ± 13 μm. Drug loading and release rates are being determined by HPLC-UV analysis.

Nuvala Fomban grew up in Cameroon-west Africa. He attended high school at Bali college-Cameroon and obtained his first BS in Biochemistry from the University of Yaoundé 1-Cameroon. He is presently doing a second BS in Chemical Engineering and will be starting his MSC in Biomedical Engineering summer 2006. He has passion for research and his main goal is to obtain a Ph.D. in Biomaterials and Bioengineering.

Poster#: ChE.6

Entrapment and Release Characteristics of Niosomes Determined by Ultraviolet Absorption

Monica Gonzalez, Elizabeth Hood, Michael VanAuker

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Niosomes are self assembly vesicles studied as part of drug delivery systems because of their capacity to encapsulate therapeutic agents. Niosomes were made of surfactants, cholesterol and dicetyl phosphate in a 1:1:0.1 molar ratios. Niosomes were synthesized encapsulating carboxyfluorescein dye. Unencapsulated dye and unformed lipids were separated from the sample using gel exclusion chromatography (GEC). Monitoring UV absorption during GEC provides data to calculate entrapment efficiency. Ultraviolet elution profiles were used to determine dye entrapment in niosomes and release rates over time. The effects of changing concentrations of vesicle components, 0.0144M vs. 0.144M, on entrapment efficiency and release rate were determined.

Presenting author short bio: Monica Gonzalez is a senior in Chemical Engineering. She graduated from the Academy of the Holy Names in Tampa, FL and came to the University of South Florida to follow her dream of achieving an engineering degree. She has participated in undergraduate research for 3 years in the Biomedical Engineering field.

Presenting author's plans for the future: Monica plans to attend USF to achieve a Masters degree in Biomedical Engineering. She also aspires to continue her studies to get her PhD also in Biomedical Engineering to have a research oriented career.

Poster#: ChE.7

IONIZATION AND MOLECULAR RECOGNITION PHENOMENA IN SELF-ASSEMBLED SURFACES OF BOWL-SHAPED MACROCYLIC MOLECULES

Department of Chemical Engineering

Justine Molas, Dr. Vinay Gupta

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Our goal is to understand the ionization of self-assembled monolayers (SAMs) of macrocyclic molecules which act as hosts for recognition of charged guest species. Specifically, SAMs of two calix[4]resorcinarene derivatives on gold substrates were prepared. Ionization of these surfaces was investigated using a surface plasmon resonance (SPR) technique and contact angle measurements. Solutions of varying pH were used as a probe to test the differences in the advancing angles on these SAMs. SPR characterization allows measurement of the optical thickness of ultra-thin films and to monitor the dielectric changes at a solid-liquid interface. For surfaces of both resorcinarene derivatives, contact angles decrease and SPR shows that dielectric changes in the surface occur as the pH increases.

Presenting author short bio: Justine Molas grew up in Clearwater, FL with her parents Felix and Genevieve. She attended The Center for Advanced Technologies at Lakewood High School in St. Petersburg, FL. She is currently a junior student in Chemical Engineering and joined the REU project in January, 2005.

Presenting author's plans for the future: Justine is pursuing a Bachelors degree in Chemical Engineering. After she graduates she hopes to work in research and development or manufacturing at a pharmaceutical company.

Poster#: ChE.8

Characterization of the Shear Moduli of Polymer and Polymer/Solvent Systems Using a Thickness-Shear Mode (TSM) Quartz Resonator

Anthony Richardson, Venkat R. Bhethanabotla, and Stefan Cular

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Characterization of the storage modulus, G', loss modulus, G'', and, consequently, the shear moduli, G ($G = G' + jG''$), of polymer and polymer/solvent systems was conducted in this study using a thickness-shear mode (TSM) quartz resonator. The polymeric substance polyisobutylene was spin-coated on the surface of the TSM device and, upon inducing oscillation of the device at its resonance frequency (several mega-Hertz), the impedance characteristics were measured. In addition, the polyisobutylene was exposed to known weight concentrations, up to 20%, of benzene, toluene, cyclohexane, and chloroform vapors diluted in nitrogen gas, and the impedance characteristics were measured. These data sets collected from the impedance analyzer were then examined by modeling the polymer and polymer/solvent loaded TSM device with an electrical equivalent circuit model to yield the shear moduli, which enters as a parameter in the mathematical theory describing this circuit model.

Presenting author short bio: Anthony Richardson was raised in Damariscotta, Maine until the age of ten when his family moved to Florida in 1994. He attended St. Stephen's Episcopal School in Bradenton from which he graduated in 2003 to pursue a chemical engineering education at the University of South Florida.

Presenting author's plans for the future: The degree of education to which Anthony Richardson would like to achieve is at least a Master's degree in chemical engineering. Uncertainty remains within him as to whether he wants to obtain a PhD or seek a medical or law degree.

Poster#: ChE.9

Detection of Sodium Halides in Aqueous Systems Using Ultra-Thin Hydrogel Layers on a Quartz Crystal Microbalance

Jackie Shepard, Venkat Bhethanabotla, and Ryan Toomey

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Poly-N-isopropylacrylamide (pNIPAAm) is a reversible, thermoresponsive hydrogel that has been shown to recognize various concentrations of sodium halides in the bulk. We propose to develop a new technique for detection of sodium halide using ultra-thin layers of pNIPAAm on a quartz crystal microbalance (QCM). This technique will potentially lead to more selective testing of target analytes in aqueous media such as heavy metals for potable water testing and antibody/antigens for earlier detection of diseases. The feasibility of this technique will be presented with sodium halide concentration effects on the fundamental resonant frequency of the QCM with variations in temperature.

Presenting author short bio: Jackie grew up in Palmetto, Florida and attended Bradenton Christian School. She is currently vice president of Tau Beta Pi, the recipient of the Kelly Clark scholarship, and has worked in the Sensors Research Laboratory of Dr. Bhethanabotla for the past two years. Jackie will receive a B.S. in Chemical Engineering and a B.A. in Mathematics in May 2006.

Presenting author's plans for the future: Jackie plans to pursue a Ph.D. in Chemical Engineering at Northwestern University followed by a career in research and development of pharmaceuticals.

Poster#: ChE.10

Solubility of Paraffin in Supercritical Carbon Dioxide

Stephanie T. Wong, Raquel Carvallo, Brandon B. Smeltzer,

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Carbon dioxide under supercritical conditions exhibits liquid-like solvent properties while maintaining gas-like viscosity, thermal conductivity and diffusivity. The cloud point of paraffin-based wax (mp 53-58°) was determined at temperatures ranging from 35°C to 60°C and pressures from 133.8 to 280 bar in supercritical carbon dioxide (SC-CO_2). A supercritical fluid phase monitor was used to observe the phase behavior and solubility of paraffin wax under varying temperature, pressure and concentration sample conditions. The data obtained, coupled with modeling, will be used in the development of environmentally friendly pathways for the coating of particles, surfaces and impregnation of porous matrices in an effort to impact heat retention and increase thermal capacity of materials synthesized.

Presenting author short bio: Stephanie Wong was born in Los Angeles, California. She has lived in cities in California, New Mexico, Texas, Illinois and Florida. She attended Florida International University in Miami, Florida for two years before transferring to the University of South Florida.

Presenting author's plans for the future: Stephanie intends to pursue graduate studies while participating in ongoing research. In the future, Stephanie plans to apply her knowledge in chemical engineering to the fields of biology and medicine.

2. Civil and Environmental Engineering Abstracts:

Poster#: CEE.1

Use of Embedded Galvanic Anodes for preventing corrosion around concrete repairs

Maria Constanza Suarez, Dr. Alberto A. Sagues

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Corrosion of reinforcing steel leads to the formation of rust around the steel. This rust is expansive which causes the surrounding concrete to crack. Repair and rehabilitation of the structure can be more cost effective than replacing the structure. The objective of the research is to investigate a method intended to make this repair process more effective, increasing the life of these repaired concrete structures by introducing anodes in the patch area that prevent the corrosion extending to nearby zones. Specifically, the performance of new anode types will be established. Measuring the potentials, currents and resistance of the specimens in this investigation will provide the data required to improve the anodes performance.

Presenting author short bio: Maria Constanza Suarez grew up in Cali, Colombia. She attended the "Colegio Aleman" (German School) in Cali before she came to USF. She studied English for a year at the English Language Institute at USF. Then she started her engineering studies in 2002. She has been working in the Corrosion lab since 2004.

Presenting author's plans for the future: Maria Constanza Suarez is pursuing a degree in Civil Engineering with emphasis in structures. She plans to work on a construction company after graduation. Then, she plans to enroll in a Master's Degree in Civil Engineering to complement her studies.

Poster#: CEE.2

Clay Settling Areas and Their Effect on the Surrounding Aquifers

Debra Penny, Ken Nilsson, Dr. Mark Ross, Dr. Ken Trout

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Clay settling areas (CSAs), which are a waste product of phosphate mining, have been thought to have an impact on the surrounding surficial aquifer, deeper Floridan Aquifer and overall on the stream flow and wetland water levels of surrounding waterways including of one of Florida's largest rivers, the Peace River. However, limited precise measurements and models exist to understand the behavior. This research project has a long-term goal of determining this impact, if any, on the Hydrology of West-Central Florida. Wells have been installed on a CSA and the surrounding area, so that water-level measurements can be taken. Other measurements include stream flow and newly designed instruments to measure dynamic soil moisture. These measurements, together with mathematical modeling will show the relationship of surface and groundwater fluxes between the CSA and the surrounding wetlands, surficial and Floridan aquifers. Preliminary results for this project show that groundwater bound in the CSA mostly supports evapotranspiration flux returns to the atmosphere and only very small fluxes to the surrounding surficial aquifer.

Author's Bio: Debra Penny was born in Tampa, Fl. She moved at a very young age, to Wauchula, Fl, where she was raised. She graduated from Hardee High School and moved back to Tampa to attend Hillsborough Community College, where she received her A.A. in early childhood education. She then, transferred to the University of South Florida to get her Bachelor's degree in early childhood education. About one year away from finishing her education degree, she decided that her education was not challenging enough, so she decided to change majors to civil engineering.

Author's Future Plans: Ms. Penny will be receiving her B.S. in Civil Engineering this semester. She then plans to transfer to the Geology Department at USF to get her master's degree in Hydrogeology. After graduation, she wants to work for The United States Geological Survey (USGS). With this work, she hopes to move around the US studying the hydrology of all types of environments.

Poster#: CEE.3

Corrosion Behavior of Type 2 Aluminized Steel in Waters of Varying Scaling Tendencies

Adam Verdon*, Leonardo Caseres**, and Dr. Alberto Sagues**

*Research Experience for Undergraduate/Department of Mechanical Engineering

**Department of Civil Engineering

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In a Florida municipal system Type 2 aluminized steel drainage pipes have been corroding at an unexpectedly high rate. The cause is being investigated with water and soil samples analyses. The tests included titrations for alkalinity and hardness, resistivity of soil and water, and electrical potential of the aluminized steel in various chloride solutions. These measurements showed that the water chloride content was low, therefore it was not aggressive towards unscratched surfaces (the aluminum coating). However, high corrosion rates of the underlying steel took place.

Presenting author short bio: Adam was born in Montreal, Quebec but was raised in Miami/Fort Lauderdale, Florida. He graduated from Cooper City High school with honors and a scholar athlete award. He is in his senior year of Mechanical Engineering.

Presenting author's plans for the future: After Adam receives his USF B. S. in Mechanical Engineering he will serve as an officer for the United States Air Force.

Poster#: CEE.4

Reproducing Kernel Element Method

Przemek Kuzlo* and Assistant Professor Dr. Daniel Simkins**

*Research Experience for Undergraduate/Department of Civil and Environmental Engineering
**Department of Civil and Environmental Engineering
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This project explores the use of a new numerical method, the Reproducing Kernel Element Method (RKEM). This method has applications in many areas, in particular smooth geometry representation. Currently, geometry is represented using the Finite Element Method (FEM), which is available in many design programs. Finite elements have some drawbacks, however, which make them ill-suited for several kinds of problems. From previous investigations, it appears that RKEM may be a valuable tool for problems involving smooth geometry. RKEM shape functions are a very powerful interpolation tool that can provide much improved geometry representation over FEM.

Author's short biography: Przemek Kuzlo was born and raised in Krakow, Poland. At the age of 17 he moved with his family to Clearwater, Florida where he later graduated from Countryside High School. He is currently in his junior year majoring in Civil Engineering.

Author's plans for the future: After Przemek receives his USF Bachelor of Science in Civil Engineering he will attend graduate school.

Poster#: CEE.5

Removing Arsenic from Class I Florida Landfill Leachate using Two Commercially Available Mineral Oxides

Ryan Locicero, Douglas Oti, Michael Roe and Dr. Maya Trotz

Civil and Environmental Engineering, University of South Florida

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Arsenic in landfill leachate solutions raises concerns over groundwater contamination for unlined landfills and proper disposal or management for lined landfills. This study examines the use of two commercially available mineral oxides for the removal of arsenic from landfill leachate solutions from the Polk County North Central Landfill. These iron and aluminum oxides are used for removing arsenic from drinking water sources and the work presented here looks at removal from more complex matrices using real leachate solutions in laboratory scale bench experiments. Surface characterization (surface area, mineral type, particle size) were used to help interpret results.

Ryan Locicero: Ryan was born in St. Petersburg Florida and grew up in the bay area. Prior to attending The University of South Florida Ryan was a student at Osceola High School in Seminole Florida. While attending the University of South Florida Ryan has worked under distinguished University Professor Dr. Alberto A. Sagues focusing on corrosion research, and Dr. Maya Trotz with a concentration in arsenic and heavy metal ions in complex matrices like landfill leachate.

Ryan Locicero's Future Plans: Ryan will finish his undergraduate degree in the spring of 2006 with his concentration in structural engineering. Ryan has had two and a half years of experience in the REU program along with an internship with Environmental technologies, Cargill Crop Nutrition, and American Consulting Engineers. Ryan's ten year goal is to become an independent site developer / general contractor, focusing on land development.

Poster#: CEE.6

Determining Total Chloride Content in Aggregate and Mortar Powder

Edward Lopez* and Dr. Alberto Sagues**

*Dept. of Mechanical Engineering/ **Dept. of Civil Engineering

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To determine the chloride content difference between mortar and aggregate from Vaca Cut bridge (Florida Keys) concrete. Samples were extracted from a two centimeter band (~8-10 cm depth) on a concrete core. Mortar and aggregate material were identified by their physical appearance on the core surface. To reduce cross-contamination, drilling was confined to small shallow holes. The separate powders were then tested to determine the chloride concentration. The powder was tested through the Florida D.O.T. method for determining total chloride (FM 5-516). The chloride content in aggregate was found to be generally higher than that of mortar.

Presenting author short bio: Edward "Ed" Lopez grew up in Miami, Florida where he attended Charles W. Flanagan High School. He moved to Tampa in the fall of 2002 and is now in his senior year in Mechanical Engineering.

Presenting author's plans for the future: After obtaining his B.S. from U.S.F. in mechanical engineering, Ed plans use to work in areas that include robotics, engineering materials and, structural analysis.

*Adviser

Poster#: CEE.7

Potential for Chloride Interferences in Environmental Measurements

Jessica Linville, Aaron Roberts, Dr. Audrey Levine

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Environmental Research

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Many new technologies that are used for production of drinking water emit waste streams that may have high chlorine levels (over 1,000mg/L). To develop treatment methods for managing these waste streams, it is important to conduct characterization and treatability tests. Traditional methods for characterizing water quality are designed to analyze water that is low in dissolved solids and chlorides. Since, chloride levels in waste streams can be several orders of magnitude higher than natural water samples, it is important to ensure that the chloride levels do not introduce interferences into the analytical procedures.

An on-going project in the Department of Civil and Environmental Engineering is to investigate the use of anion exchange treatment of groundwater. Given that anion exchange resins are regenerated with brine solution, chloride levels can range from 10 mg/L to 65,000 mg/L. The purpose of this experiment is to determine if the amount of chloride and the source of the chlorides affect the results of characterization tests. Different types of chloride salts can introduce different cations including sodium, potassium, calcium or ammonium. The different salts to be tested include sodium chloride, ammonium chloride, calcium chloride and potassium chloride. Characterization tests include alkalinity, chemical oxygen demand (COD), pH, nitrogen (total and ammonia), sulfate, sodium, calcium, magnesium, potassium, and iron (total and dissolved). Results from this study will be used to develop improved techniques for characterizing environmental samples that have high levels of dissolved solids.

Presenting author short bio: Jessica Linville is a sophomore in the Department of Chemical Engineering and is in the Honors College. She graduated from the Criminal Justice Academy at Pinellas Park High School. This is her first year in the REU program.

Presenting author's plans for the future: Jessica plans to get her BS in Chemical Engineering and her MS in Environmental Engineering. Jessica hopes to find alternate ways of making chemicals that do not leave hazardous by-products, mostly from industrial plants.

3. Computer Science and Engineering Abstracts:

Poster#: CSE.1

Developing a Visual Memory Assistant: The Portable Facial Recognizer

Oluwabukola Akinbo, Dr. Rangachar Kasturi and Dr. Sudeep Sarkar

Department of Computer Science and Engineering

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Face recognition is a task that humans perform routinely and effortlessly in their everyday lives. Yet, as intelligent as humans are, they only have the potential to recognize and retain a limited amount of information. This raises the need to effectively identify a person when seen another time. In such cases, the use of a portable device capable of effectively detecting and matching subjects as well as displaying their names proves to be essential. To solve this problem, we propose an approach which entails the design and implementation of an effective and wearable device that would be capable of recognizing people based on their facial characteristics and displaying the names of successfully identified subjects. We examined the performance of four face recognition algorithms on data collected indoors from 14 distinct subjects under varying conditions using a mobile device. For this experiment, the true acceptance rate for each of the algorithm used was at least 90%. Future work includes but not limited to analysis of outdoor data collected using a mobile device, and over-the-network data processing between a mobile device and a computer.

Author Biography: Oluwabukola Akinbo was born and raised in Nigeria. She moved to the States upon graduation from high school in 2001 to attend the University of South Florida. Oluwabukola Akinbo is currently working on wearable facial recognition under the supervision of Dr. Kasturi and Dr. Sarkar. Upon graduation, Oluwabukola intends to proceed directly to a masters program.

Poster#: CSE.2

Using Computer Vision to Detect Thin Wires for Use in Low Altitude Helicopters

Melinda Black, Joshua Candamo, and Dr. Sudeep Sarkar

Department of Computer Science & Engineering / Image Analysis Research Laboratory

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Every year, there are helicopter accidents caused by the inability of the helicopter pilots to identify and avoid obstructions such as thin wires. The goal of this is project is to develop an algorithm that will detect thin wires such as powerlines. This detection algorithm can then be used to alert helicopter pilots of powerlines near the helicopter and reduce the occurrence of helicopter crashes caused by powerline obstructions. A prototype detection algorithm has been developed and we are now in the testing phase. We are in the process of gathering videos of thin wires to test against the algorithm in order to obtain statistics about the performance of the algorithm. The algorithm can either fail to detect the thin wire, correctly detect the thin wire or falsely detect a thin wire that does not exist (false positive). Detecting thin wires near a low flying helicopter can be very difficult. An example of one difficulty is that it may be hard to differentiate between a nearby thin wire and background clutter such as trees or buildings. However the successful development of this algorithm will have many valuable military and civilian uses that will save lives each year.

Presenting author short bio: Melinda Black is from the South Florida area before moving to Tampa to attend the University of South Florida. She works full time while earning her degree from USF. She is currently involved in on going research in the Computer Vision lab at USF.

Presenting author's plans for the future: Melinda plans to earn her Bachelor degree in Computer Engineering.

Poster#: CSE.3

Fast Feature Selection Algorithm for Data Classification

Daniel J. Garcia, Dr. Lawrence Hall, Dr. Dmitry Goldgof, Kurt Kramer

Department of Computer Science and Enginerring

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Feature selection methods are used to find the set of features that yield the best classification accuracy for a given data set. This results in better training and classification time for a support vector machine, in addition to better classification accuracy. Feature selection, however, is a time consuming process unfit for real time application. In this paper, we explore a feature selection method that uses randomly generated feature sets of fixed size. The results from the experiments indicate the requirement of considerably less time to find sets of features that yield accuracies comparable to other feature selection methods.

Presenting author short bio: Daniel J. Garcia was born and raised in Maracaibo, Venezuela where he completed his basic studies. At age 14 he moved to Atlanta, Georgia where he attended Riverwood High School. Early in the year 2000, Daniel moved to Tampa, Florida. There he attended Leto High School. He graduated from Leto High School in 2002. Daniel has been attending USF since the spring semester 2003.

Presenting author's plans for the future: Daniel J. Garcia plans to achieve a bachelor's degree in Computer Science and pursue a carrer in software development.

Poster#: CSE.4

Investigation of Machine Learning Classification Algorithms in Gene Expression Data

Andrew M. Hoerter, Dr. Steven Eschrich, Dr. Dmitry Goldgof

Computer Science and Engineering

Author email: ahoerter@eng.usf.edu

Gene expression microarrays permit quantification of expression for over 54,000 known transcripts in biological samples. Using these expression profiles, classification algorithms can be used to identify links between certain genes and the presence of disease, or to predict patient outcome. We examined the accuracy and stability of various classifiers in predicting lung cancer prognosis and identification of leukemia subtypes, while varying classifier parameters as well as the number of genes examined. We concluded that the largest variations in accuracy arose from the number of genes used, indicating that gene selection procedures are critical to consistently accurate predictions in expression data.

Presenting author short bio: Andrew Hoerter grew up in Orlando, FL, and attended Trinity Preparatory School, Rollins College, and Valencia Community College before transferring to the University of South Florida. He is currently a senior in the Computer Science and Engineering department.

Presenting author's plans for the future: Andrew is pursuing a bachelor's degree in Computer Science and hopes to graduate in May of 2006. He intends to become a software engineer, with a particular focus on embedded systems.

Poster#: CSE.5

Evaluating Classifier Performance with a New Statistical Approach

Remy Anne R. Losaria, Dr. Larry Hall

Department of Computer Science and Engineering

Author email: rlosaria@csee.usf.edu

Decision-tree ensemble creation techniques are powerful concepts in predictive data mining. Using a unique statistical test called 5x2-fold cross validation, randomization-based approaches to creating classifier ensembles can be assessed in terms of performance and accuracy. Through experiments with more than 50 publicly-available datasets, we provide a comprehensive analysis of each technique through the 5x2 cross-validation experiments in comparison with the standard 10-fold cross validation statistical tests conducted in the past. It has been shown that the 5x2-fold cross validation experiments reduce the elevated Type I error inherently present in the 10-fold cross validation method. Our results support this view, and we show that the 5x2-fold cross validation analysis results in less statistically accuracy significant wins or losses when evaluating the different decision-tree ensemble creation techniques.

Presenting author short bio: Remy Losaria was born and raised in Manila, Philippines. She and her family moved to the United States in pursuit of better education and employment opportunities. Remy had always enjoyed working with computers and programming in general. Her other interests include dancing ballet and spending time with friends.

Presenting author's plans for the future: Remy Losaria is graduating in May 2006 with her Bachelor's Degree in Computer Engineering. She is currently thinking about pursuing her Master's Degree in Computer Science.

Poster#: CSE.6

Evaluation of Network Capacity Estimation Tools

Shannon M. Osmon, Cesar D. Guerrero, and Prof. Miguel A. Labrador, Ph.D.

Department of Computer Science and Engineering
Author email: osmon@csee.usf.edu

The goal of this project is to evaluate network capacity estimation tools utilizing a controlled environment. There is a recent interest in investigating these tools because of the high applicability and benefits. For instance, they can be used in communication protocols to improve their performance, in network management tools to provide accurate network utilization, in routing algorithms to send data through the least congested routes, etc. However, existing tools present accuracy, response time and overhead problems that make them not suitable for all applications and network environments.

Our research consists of two main components. Setup a testbed to emulate different type of networks and communication channels, and install different network capacity estimation tools. With these two components, we will evaluate the suitability of these tools in different network applications.

In this work we evaluated Pathrate, one of the most important tools to measure channel capacities. Our results indicate that the tool is accurate for low and medium channel capacities but fails in high speed networks. Our analysis reveals that higher precision clocks are needed at the end hosts. In our future research, we will investigate the use of a hardware clock mechanism instead of the operating system-based clock mechanism that they currently use.

Presenting author short bio: Shannon Osmon was born in Tiffin, Ohio attending Berea College, Kent State University, and serving in the Army before moving to Florida and attending the University of South Florida.

Presenting author's plans for the future: Shannon plans on obtaining a Computer Science degree and entering the network security field.

4. Electrical Engineering Abstracts:

Poster#: EE.1

Injector and Beamline Tuning of a Prototype Electrospray Ionization System

A. Cascio[1], M. Beerbom[1], J. M. Anthony[2], R. Schlaf[1]

1. USF Electrical Engineering Department, 2. Elion, Inc.

Author email: cascio@eng.usf.edu

A prototype electrospray ionization (ESI) system was constructed for the purpose of thin film deposition and macromolecular patterning. The system consists of a multi-stage, differentially-pumped vacuum system. Faraday cups installed in the system, which permit measurement of the ion current in the beamline, have allowed for an orderly optimization of the system to begin. A variety of techniques enabled by ion optics, mechanical elements, and pneumatics are being used to manipulate and condition the ion beam. Maximizing the amount of ion current flowing through the system, therefore yielding the most efficient deposition, represents the ultimate goal of this optimization.

Presenting author short bio: Anthony Cascio was born and raised in Tampa, FL. He attended C. Leon King Senior High School in Tampa, and is a recipient of the International Baccalaureate Diploma.

Presenting author's plans for the future: Anthony is currently pursuing his BSEE degree, and plans to continue both his studies and his research at the graduate level. His ultimate goal includes achieving a research position in the material science field at a national research laboratory.

Poster#: EE.2

Protein Microarrays and spatially resolved photoluminescence in bio-conjugated Quantum Dot-Probes for Early Cancer Detection

Fedorenko I, Zajac A, Ostapenko S, Dybiec M, Ostapenko S, Zhukov TA .

H. Lee Moffitt Cancer Center & Research Institute;
University of South Florida, NNRC, Tampa, Florida
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We propose to increase the accuracy of early cancer detection through the application of nanotechnology, where luminescent semiconductor quantum dots (QDs) are conjugated with biomolecules. QD-bioconjugates offer detection and analysis of extremely low marker levels and fluctuations, allowing early detection of cancer. We have constructed QDs probes by conjugation with antibodies specific to the selected lung, ovarian and prostate cancer serum and cell-based protein markers. In our microarrays we print capture antibody or antigene (in reverse phase assay module) at different concentrations on a functionalized substrate using MicroGrid micro arrayer, which is then processed with conjugated QDs where detector antibody recognizes captured or printed antigene. Confocal microscope and quantitationimage analysis utilizing computerized dynamic analysis system (CDAS) are used for imaging of the micro arrays, from where we can measure the area and intensity of array spots for quantitative analysis of cancer-related protein markers in clinical specimens.

Presenting author short bio: Inna Fedorenko was born and grew up in Odessa, Ukraine. There, she attended elementary school and was a student at the Olympic Reserve School of Figure Skating until she moved to Tampa in 1997. She graduated with an International Baccalaureate Diploma from Hillsborough Senior High School in Tampa.

Presenting author's plans for the future: Inna Fedorenko plans to graduate USF with a double degree in Biology and Anthropology, and pursue a research career with NASA, or another government affiliation.

Poster#: EE.3

INVESTIGATION OF POLYTHIOPHENE INTERFACES VIA PHOTOEMISSION SPECOTROSCOPY AND ELECTROSPRAY THIN FILM DEPOSITION

James Lyon, Yeonjin Yi, Anthony Cascio, Martin Beerbom, and Rudy Schlaf

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The interface between the conjugated polymer poly-3(hexylthiophene) and various substrates was investigated, since the applied device properties depend highly on the electronic structures of the interfaces. The P3HT was deposited on Au and highly-oriented pyrolitic graphite with an electrospray system which allowed us to grow polymer thin films in in vacuum. The electronic structures were analyzed in between deposition steps with x-ray and ultraviolet photoemission spectroscopy (PES) without breaking the vacuum. The PES spectra series allowed for a detailed examination of the interface line-up, including the injection barriers and interface dipoles, as well as the properties of the P3HT overlayer.

James Lyon grew up in Tampa, Florida. He attended Sickles high school, graduating in 2000, and was admitted to the University of South Florida in the fall of 2000. He received a bachelors in computer engineering and a minor in mathematics in the summer of 2005, graduating from the honors college. He has been working as a research assistant since May 2005, and a teaching assistant since January 2006.

James Lyon plans to pursue his masters in electrical engineering, after which he will either pursue a PhD in electrical engineering or enter industry as a researcher of solar cells and other energy devices.

Poster#: EE.4

Solid State Ionic Conductor Development

Donald Payne, Dr. Burton Krakow, Lars Ecklund-Mitchell

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Certain solid state ionic conductors become ideal electrolyte materials at slightly elevated temperatures. Materials such as cesium hydrogen sulfate demonstrate a reduction in electrical resistance by four to six orders of magnitude at 150°C. This greatly reduces the voltage potential required to sustain electrolysis. One ideal application of this technology is in the coal-fired power industry. There is an abundant source of waste heat at or above the required temperatures, and an abundance of hydrogen sulfide which is created as a waste product. The hydrogen sulfide can be electrolyzed into hydrogen, oxygen, and elemental sulfur at a relatively low voltage. The result is the removal of a potentially hazardous material from the waste stream and the collection of two valuable byproducts at a fraction of the cost of remediation.

Presenting author short bio: Donald Payne is a lifelong resident of Tampa, graduating from King High school and later serving his country in the United States Navy. He graduated from Hillsborough Community College with honors in May of 2004, earning the degree of Associate in Arts. He was a member of the *All-Florida Academic Team* in 2004 and received the award for *Outstanding Academic Excellence in Physical Science* for 2003-2004.

Presenting author's plans for the future: Mr. Payne plans to graduate from The University of South Florida in the spring of 2007 with a bachelor's degree in electrical engineering, and begin a career in the power industry, specifically power generation from renewable resources.

Poster#: EE.5

Temperature Varying Operational Characteristics of CdTe Solar Cells

Andrew Quecan, Sara Harrison, and Dr. Chris Ferekides

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To acquire a better understanding of the operational characteristics of the CdTe solar cell, a vacuum chamber was developed for testing the dark and light J-V characteristics of solar cells in a range of temperatures (100K-400K). The device uses liquid nitrogen and flexible heaters to vary the temperature of the cell while the J-V data are measured using four-probe measurement techniques. After several measurements, the open-circuit voltage of CdTe cells increased as temperature decreased. As more cells are tested with varying light intensities, more useful information of the characteristics will be attained to help develop a more efficient solar cell.

Andrew Quecan short bio: Andrew Quecan grew up in various cities in Florida: Orlando, Ft. Lauderdale, and New Port Richey. He has also lived in Idaho and Washington State. He was homeschooled for most of his education, while enrolling part-time at St. Petersburg College.

Andrew Quecan's plans for the future: After finishing my undergraduate and graduate work in electrical engineering, I look forward to attending law school. Through my research experience in engineering, I hope to gain valuable experience to eventually shape public policy, especially with a focus on alternative energy.

Sara Harrison short bio: Sara Harrison grew up in Wesley Chapel, Florida. Before attending USF, she attended Wesley Chapel High School.

Sara Harrison's plans for the future: After obtaining a bachelor degree in electrical engineering, Sara plans to pursue a doctoral degree in either of the fields of microelectronics or biomedical engineering.

Poster#: EE.6

CMOS/VLSI Cells for Advanced Applications

Benjamin R. Simpson, V.K. Jain PhD

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The focus of this project is on the design of an MA_PLUS [1], which is an enhanced Multiply-Add cell. Before designing the MA_PLUS the study of its components was performed. I studied the 16 bit and 32 bit two's complement (TC) adders. With this knowledge I was able to move on to the study of 8x8 bit and 16x16 bit TC multipliers. Once these cells are understood I can begin with the design of the main cell, the MA_PLUS. The design will include the layout, i.e. physical design of the MA_PLUS. Simulation and testing will then follow using the 'esim' tool and verification using C code. The design of the MA_PLUS is based on the highly efficient VLSI cell developed at USF in Dr. Jain's lab. Future plans include the implementation into a variety of applications such as digital signal processing, image processing, seismic analysis and 'System on a Chip' [2].

With a view toward energy conservation, the idea of a sleep transistor network was studied and applied to a PLA [3].

Presenting author short bio: Ben Simpson was born and raised in Tampa, FL and graduated from Armwood High School before enrolling in the Electrical Engineering program at the University of South Florida where he is currently finishing his bachelor's degree.

Presenting author's plans for the future: After receiving his bachelor's degree, Ben would like to attend graduate school and pursue a career in research and development.

[1] V. K. Jain, and S. Shrivastava, "Rapid system prototyping for high performance reconfigurable computing," *Design Automation for Embedded Systems Jr,* pp. 339-350, August 2000.

[2] V. K. Jain, S. Bhanja, G. H. Chapman, and L. Doddannagari, "A Highly Reconfigurable Computing Array: DSP Plane of a 3-D Heterogeneous SoC," *Proc. IEEE Int. System on a Chip Conf.*, pp. 243- 246, Sept. 2005.

[3] S. K.Hsu, S. K. Mathew, M. A. Anders, B. R. Zeydel, V. G. Oklobdzija, R. K. Krishnamurthy, S. Y. Borkar, "A 110 GOPS/W 16-bit multiplier and reconfigurable PLA loop in 90-nm CMOS," IEEE J. of Solid State Circuits**,** pp. 256-264, Jan. 2006**.**

Poster#: EE.7

Patterned Printing of Biomaterials Using Piezo-Inkjet Printer Technology

Brian Vohaska, Marla Bhoorasingh, and Rudy Schlaf

Associate Researcher, Electrical Engineering USF

Author email: bvohaska@eng.usf.edu, mbhoora2@mail.usf.edu

The purpose of this experiment was to show inkjet technology is capable of producing well defined patterns of bioactive materials. In this experiment a modified piezoelectric inkjet printer was used to print bioactive solutions onto glass. The printer was modified by replacing the ink cartridges with generic cartridges containing an active Horseradish Peroxidase (HRP) solution. The solution was then printed onto a glass substrate and allowed to dry in unshielded atmosphere. After printing the solution in a predefined pattern, the HRP was subjected to a developer solution to test bioactivity. The results obtained from the experiment showed that the HRP survived the piezoelectric process and subsequent evaporation of H2O from the glass and that a well defined pattern could be achieved without destroying the HRP. Further experimenting is underway to test viability of sensor capable biomaterials.

Presenting author short bio: Brian Vohaska grew up living in various places and cultures before attending Venice High School where he graduated with Honors. He then was invited into the Honors College at USF where he continues his studies in mathematics and physics with special interest in nanotechnology.

Marla Bhoorasingh grew up in Orlando Florida where she attended West Orange High School studying in the advanced placement program. Upon Graduation she decided to attend USF. She is currently studying Chemical Engineering with special emphasis on nanotechnologies.

Presenting author's plans for the future: Brian plans on attending graduate school at a prominent university studying law or theoretical physics. Marla plans on pursuing a career in nanotechnology after attending graduate school at the University of California- Berkley.

Poster#: EE.8

Measurement of RNA Density of States, Ionization Energy, Work Function, and Charge Injection Barriers to Inorganic Materials

J. Magulick, M.M. Beerbom, B. Lagel, A.J. Cascio, R. Schlaf

USF Department of Electrical Engineering

Author email: JPM3502@aol.com

In light of recent conductivity measurements on DNA strands, which yielded inconsistent results ranging from insulating to metallic, it is interesting to investigate the electronic structure of oligonucleotides. In our experiments we directly measured the highest occupied molecular orbital (HOMO) density of states, the ionization energy, the work function and the charge injection barriers to graphite of RNA homopolymers. This was achieved using photoemission spectroscopy (PES) in combination with clean multi-step in-vacuum deposition of RNA thin films using electrospray deposition. Multi-step depositions without breaking vacuum are enabled by this technique. The presentation will give an introduction to the measurement technique, and introduce the experimental set-up. Data from experiments on RNA homopolymer interfaces to graphite will be discussed, conclusions with regard to conductivity measurements made, and comparisons of each nucleotide contact discussed.

Presenting author short bio: John Magulick grew up in Seminole, Florida and attended Osceola High School. He is currently an undergraduate in Chemical Engineering.

Presenting author's plans for the future: John Magulick will earn a B.S. in Chemical Engineering. He plans on attending medical school and becoming a physician.

Poster#: EE.9

Computer modeling of resonance vibrations for wafers for solar cells

Oleg Polupan, Supervisor: Dr. Ostapenko

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opolupan@mail.usf.edu

We intend to develop a method for early detection of cracks in wafers for solar cells. The method is based on wafer excitation with ultrasonic vibrations, and finding the resonance frequencies of the wafer. A computer modeling method was developed and tested to aid with the experimental results. We have studied the resonance vibrations in these wafers focusing on symmetric vibrations that were confirmed by the experiment. Preliminary results indicate that cracks in wafers for solar cells cause a low frequency shift that is proportional to the size of the crack. The magnitude of the frequency shift also depends on the position of the crack, and the resonance mode of the wafer. Based on these results we are developing a procedure to detect the existence of cracks in wafers for solar cells, and pinpoint their approximate location on the wafer.

Presenting author short bio: Oleg Polupan was born in Kiev Ukraine. He attended high school and received an Abitur diploma (International Baccalaureate equivalent) from the "Alexander Von Humboldt" school in Mexico city, Mexico. He moved to Tampa in 2003.

Presenting author's plans for the future: The author is planning to graduate from USF with a double major in Mathematics and Economics and pursue a further mathematics degree in a graduate school.

Poster#: EE.10

Selective Growth of Silica Nanowires in Silicon Catalyzed by Pt Thin Film

Vanessa Gonzalez, Praveen Kumar Sekhar, Dr. Shekhar Bhansali

University of South Florida

Department of Electrical Engineering

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This experiment reports the growth of amorphous silica nanowires in a silicon wafer deposited with Pt thin film using the Vapor Liquid Solid (VLS) growing mechanism. The diameter of the nanowires grown with the VSL mechanism ranged from 50 nm to 500 nm. The Pt film was varied from 2 to 100nm to observe the growth at different thickness. For a thickness greater than 10nm, no nanowires are produced, but a layer of Pt2Si solidifies on the surface of the silicon wafer. This selectivity to the thickness of the Pt film, has been used to create regions of nanowires connected to silicide (Pt2Si) interconnects simultaneously in a single furnace treatment. This new approach has permitted the realization of hybrid interconnects in silicon for many applications in nanotechnology.

Presenting Author short Bio: Vanessa Gonzalez was born and raised in Valencia, Venezuela. She graduated from High School at La Salle, Valencia, and she came to the United States in 2001. She is a senior in Electrical Engineering.

Presenting author's plans for the future: Vanessa's plans for the future are to graduate, and start working toward her masters in Electrical Engineering. She is interested in the area of Microelectronics, and communications.

5. Industrial Engineering Abstracts:

Poster#: IE.1

Simulation-based Optimization for Region Design in the U.S. Organ Transplantation Network

Gabriel Zayas-Cabán, Patricio Rocha, and Dr. Nan Kong

Department of Industrial and Management Systems Engineering

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The procurement and allocation of organs has been a contentious issue in the U.S. A major concern is the large amount of organ wastage due to allocation delays that results in organ viability loss. There exist two major organ allocation preferences: (1) allocates organs to potential recipients with greatest medical needs regardless of location; (2) allocates organs to potential recipients with high priority in the same locale. To balance these two preferences, the United Network for Organ Sharing developed a three-tier hierarchical allocation system that divides the U.S. into 11 regions composed of 59 Organ Procurement Organizations (OPOs). A procured organ is first offered locally, then regionally, and finally, at the national level. This research applies simulation-based optimization to find the best way to group OPOs into regions, addressing both allocation efficiency and equity.

The allocation process described above is too complex to model analytically. Using simulation, we are able to represent the process more faithfully. Nevertheless, one disadvantage of simulation is that only a small number of system configurations can be evaluated within a reasonable amount of time. In our problem, estimating one feasible regional configuration is computationally prohibitive. On the other hand, optimization provides efficient methods to select the best configuration among an enormous number of possibilities. The optimization technique considered in this research is a type of metaheuristic known as genetic algorithm. A genetic algorithm can be understood as the intelligent exploitation of a random search. However, applicability of optimization techniques tends to require a closed-form system representation. Therefore, there is a need for integrating optimization with simulation.

In this presentation, we describe our simulation-based optimization approach that embeds genetic algorithms for combinatorial optimization into a clinically based simulation model. We demonstrate our computational implementation and discuss our computational findings. We explore the tradeoff between modeling accuracy and solution difficulty in our particular problem. Our goal is to assist organ transplantation policy makers and to enhance application of simulation-based optimization techniques in health care resource allocation problems.

Gabriel Zayas-Cabán was born and raised in Mayagüez, Puerto Rico. He moved to Columbia, Missouri at the age of thirteen where he attended Oakland Junior High School, and later, Hickman High School.

Gabriel hopes to attain a degree in Industrial and Management Systems Engineering from the University of South Florida. As an aspiring musician, he hopes to be able to perform in a latin jazz quintet across Latin America and the Caribbean after graduation.

Poster#: IE.2

Flying Wheels:

An Integer Programming Approach to the Wheel Chair Access Problem with Case Study for the Northwest Airlines at the Minneapolis/St. Paul International Airport

Egor Dolzhenko[1], Gabriel Zayas-Caban[1,2], Scott McDermott[2], Dr. Nan Kong[2]

[1] Department of Mathematics, [2] Department of Industrial and Management Systems Engineering

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Airline wheelchair access, as a significant department of revenue management, has recently been received much attention. We take long-term and short-term perspectives to consider the airline wheelchair access problem. We consider two discrete optimization models to address the allocation and routing of wheelchairs. Our objective is to minimize either long-term or short-term operational costs. Due to the unpredictable and dynamic nature of air travel, we extend these models to address uncertainty and develop a simulation model to verify the two analytical models. We use the Minneapolis/St. Paul International airport as our case study and consult for the Northwest Airlines.

Egor Delzhenko was born in Russian and studied in college there for three years before attending USF.

Egor Delzhenko plans to receive his B.S. degree from the Department of Mathematics.

This work was awarded Meritorious in the 2006 Mathematical Contest in Modeling.

6. Mechanical Engineering Abstracts:

Poster#: ME.1

New Methods In Hydrogen Storage

Derek J. Lura, Michael Jurczyk, Elias Stefanakos, Ashok Kumar

Clean Energy Research Center (CERC), College of Engineering

University of South Florida

Author email: dlura@mail.usf.edu

In the past few years there has been a growing interest in the field of hydrogen storage. Many advances have been made in chemically absorbing materials, and hydrogen tank design. While current methods are improved, we look for entirely new methods and materials for storing hydrogen in a safe efficient manner. With new materials such as carbon nano-tubes comes the hope of finding a way to store large amounts of hydrogen safely and easily. We carefully develop and test new materials and try to find methods to surpass the set goals.

Presenting author short bio: Derek Lura grew up in southern California, he moved to Florida the summer before high school, where he graduated with honors from Palm Harbor University High School (PHUHS). He is currently a Junior in Mechanical Engineering here at USF.

Presenting author's plans for the future: After graduation Derek Lura is going to continue his education, and hopes to continue doing his research while working on his Masters.

Poster#: ME.2

DISHING EFFECTS IN CHEMICAL MECHANICAL PLANARIZATION OF COPPER

Megan Pendergast, Raghu Mudhivarthi, Veera Raghava Kakireddy, Dr. Ashok Kumar

Department of Mechanical Engineering

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Chemical-mechanical polishing is widely used as the primary technique to planarize the interlayer dielectric and metal surface. Compared to the conventional chemical etching process used in Altechnology, CMP has the benefit of high Cu removal rate. However, the CMP process also introduces undesirable side effects, including dielectric erosion and metal dishing. Copper, being a softer material than the surrounding dielectric, has a stronger tendency to dish and erode below the dielectric during the mechanical action of CMP. Dishing degrades the process quality, cause significant yield losses in the BEOL, and reduce interconnect performance, especially for very wide interconnects and metal layers that have a wide distribution of pattern densities. Dishing experiments were conducted to investigate the effect of various parameters such as pad type, slurry, size of abrasive particles, temperature of the slurry in metal dishing in the damascene process and also to find the most effective parameter.

Presenting author short bio: Megan grew up in Palm Bay, Florida and graduated from Palm Bay High School in 2003. She is currently enrolled in the Mechanical Engineering program at USF.

Presenting author's plans for the future: Megan plans on graduating in spring 2007 with a Bachelors of Science in Mechanical Engineering. She would like to attend graduate school in Material Science. She hopes to obtain a research oriented career in developing new materials.

Poster#: ME.3

Programming Motors to Be Used To Aid the Disabled

Jason Chang1, Redwan Alqasemi2, Dr. Rajiv Dubey2

1Department of Computer Engineering

2 Department of Mechanical Engineering

Author email: jcchang4@cse.usf.edu

We have been trying to aid the disabled since there have been disabled persons, from walking sticks to prosthetic arms. However, with new technologies, we are now able to have the disabled help aid themselves. With the use of motors and computers, we are now able to create robotic arms which are capable of being used by them. However, the motors typically move sequentially, i.e. one after the other. The problem with this is that the robotic arm will move very rigidly. We are currently working to develop programs to enable the motors of the arm to move in concert to produce a more fluid motion.

Presenting author short bio: Jason Chang was born in Canada and grew up in Jamaica. He moved to Florida in Spring of 2001 to attend the University of South Florida. He is currently a senior in Computer Engineering here at USF.

Presenting author's plans for the future: After graduation Jason Chang is going to apply for Optional Practical Training for job experience. He then hopes to pursue a masters in Computer Engineering.

Poster#: ME.4

A New Prosthetic Fingertip Design Applying Four Bar Compliance Mechanism Concept.

Diego A. Espinosa, Dr. Craig Lusk

USF Department of Mechanical Engineering

Author email: Despinos@mail.usf.edu

For years people with prosthetic arms have struggled with their limited grasping ability. Reason being, the devices that are currently produced are not design to accomplish specific tasks that are normally performed by the human fingertips.

The goal of this project is to develop a mechanic fingertip device that will help to increase the patient's ability to grasp objects of complex shape. These devices will facilitate the accomplishment of every day actions such as the holding of a glass, pen, or picking up small pieces of food. Our hypothesis suggests that by using a four bar compliance mechanism, we will be able to design mechanical fingertips whose surface will rotate adjusting to the surface of any object of complex shape and at the same time, will provide a strong grip.

Presenting author short bio: Diego Espinosa was born in Colombia in 1984 where he grew up and began his education. Five years ago, he moved to Tampa, Florida where he attended Bloomingdale High School. After graduation, he became a University of South Florida student and worked at the Moffitt Cancer Center for about three years. Diego is currently a junior majoring in mechanical engineering and working as undergraduate research assistant under mentor ship of Dr. Craig Lusk.

Presenting author's plans for the future: Before graduation, Diego wants to join the USF's engineering five year program in order to obtain his bachelors and masters degrees. He hopes to continue using his knowledge to create new ways to improve human life.

II. Poster Preparation Guidelines:

Poster Specifications (read carefully!):

Size: 30" high and 40" wide. Poster boards and easels will be provided in the fishbowl on the Symposium day.

Posters must be designed in MS Powerpoint and printed in one piece (printing instructions: see below). Have a look at the attached Powerpoint poster template (also posted on the REU website (http://www.eng.usf.edu/~schlaf/REU/). This file produces a poster, which fits on the Engineering Computing poster plotter. You are encouraged to use your own poster design/layout as long as you use a white background (to reduce ink use and prevent wavy paper distortions) - the template is only an example, just keep the size to 30"x40"! Just select all the items on there and delete them, then copy paste your own data/images in there and add text. This will ensure you have the right size for the printer. Please, make sure your poster number (The Symposium Program with assigned poster numbers will be available on the REU website by Friday, March 24th) is on the poster located close to the headline.

If at all possible, use compressed JPEG figures in the poster (insert in your PowerPoint poster by selecting the menu command Insert/Picture/From File, and then clicking on the JPG file in the file selector window. This allows keeping the file size small reducing the printing time, and email attachment size for submission for printing.

Printing/File submission instructions:

1) **Mr. Sergio Rojas (Engineering Computing, 974-4108, srojas@eng.usf.edu) will coordinate and carry out the poster printing.**

2) **All poster PowerPoint files must be submitted to Mr. Rojas in PowerPoint format as email attachment.** The file names must adhere to the following format: LastnamePosternumber.ppt. Example: SmithEE10.ppt. Please, state your full name in the email to Mr. Rojas.

The first printing will be covered by the REU program, as long as you print the poster before or on Friday, March 31st. **If you print after the 31st or need to print more than once, a printing fee of $42 applies**. Advice: Start making your poster early and check your poster on a small printout before doing the big one. These rules had to be implemented after the first symposia, where a big printing rush occurred on the days before the symposium.