Leonardo Nava-Guerra

Faculty Mentor: Dr. Michael Khoo

Project Title: Assessing the effects of Obstructive Sleep Apnea on Cardiovascular Autonomic Control

Description: Power spectral analyses of heart rate and pulse transit time variability in overnight studies are employed to provide noninvasive assessments of autonomic function in subjects with obstructive sleep apnea and corresponding controls.
Perpetue Cadet:
Faculty Mentor: Dr. Bhaskar Krishnamachari
Project Title: Wireless Sensor Networks: Sun SPOT.
Description: Sun SPOT wireless sensors are small devices that can measure light intensity, temperature, acceleration and signal strength. I studied the SPOT's ability to send and receive information using the wireless radio and how much of the information is lost in transit.

Eric Welder:
Faculty Mentor: Dr. Paul Ronney
Project Title: Experimental Modeling of Sterilization Effects of Atmospheric Entry Heating on Microorganisms.
Description: The purpose of the project is to design the hardware and software to test the effects of an atmospheric entry heating profile on bacterial spores. Experiments will conducted in a vacuum chamber filled with a Mars-like atmosphere using a halogen lamp heating element to heat samples to a user specified heating curve via a temperature feedback program.

Meghan Jenks:
Faculty Mentor: Dr. Pin Wang
Project Title: Creating Lentivirus for Vaccination in Mice
Description: Lentiviruses have recently attracted considerable interest for their potential as a genetic modification tool to induce antigen production in dendritic cells (DCs). We explored the ability of lentiviruses enveloped with alphaviral glycoproteins to mediate transduction of DCs. We found that the alphaviral glycoproteins use C-type lectins (DC-SIGN) as attachment factors for transduction of DCs. These results, in addition to our ability to generate high titer virus, offer evidence to support the utility of lentiviruses to genetically modify DCs for the study of DC biology and DC-based immunizations.

Jorge Rodrigo Vazquez-Alvarez:
Faculty Mentor: Dr. Ellis Meng
Project Title: MEMS Pressure Sensors for Neural Prosthetic Interfaces
Description: In this project I improved a virtual instrument to be able to control a Multiplexer and make it switch between multiple channels so we would be able to get measurements from a MEMS Pressure sensor. I made a set up to perform two experiments in which we got measurements from a MEMS Pressure Device.
Irving Elyasib Santiago-Catzim:

**Faculty Mentor: Dr. Francisco Valero-Cuevas**

**Project Title:** Emulation of muscle and tendon dynamics using a DC motor

**Description:** The project consists on imitate the behavior of any musculotendon actuator by just introducing certain characteristic values as muscle length, maximum contraction velocity, or peak force, in a program which objective is force a dc motor to act as the defined muscle in real time, that means, respond to perturbations as a real muscle would do. The purpose of the project is, in some stage, decode the neurological signals that the brain uses to control the musculotendon systems in the body.

Mario DiDonna:

**Faculty Mentor: Dr. Paul Ronney**

**Project Title:** Transport effects on Trichodesmium nitrogen fixation and colony formation

**Description:** In this exploratory work we propose to study in a controlled environment the effect of the physical environment, specifically the flow field, on *Trichodesmium* colony formation and N$_2$ fixation. The flexibility of the Taylor-Couette system enables us to vary mean flow, mean shear rate and turbulence intensity completely independently of each other in a simulated oceanic environment. The experiments to be conducted are to determine the effect of the experimental parameters (*Trichodesmium* species and phenotype, transport effects, nutrient type and concentration) on the rate of colony formation and N$_2$ fixation.

Paul Martin:

**Faculty Mentor: Dr. Bhaskar Krishnamachari**

**Project Title:** Backpressure Packet Routing and Sequence-Based Localization

**Description:** The Backpressure Collection Protocol is a recently-proposed wireless packet routing scheme that holds several advantages over the state-of-the-art Collection Tree Protocol. Real time measurements for throughput and application-level implications are presented.

Juan Enrique Arguelles-Morales:

**Faculty Mentor: Dr. Jerry Loeb**

**Project Title:** Simplifying a musculoskeletal model for motion control.

**Description:** Simplification of the model of a musculoskeletal monkey arm in order to have less control inputs (less muscles) to test the SLR project (Spinal-Like Regulator).
Roman Sandler:
Faculty Mentor: Dr. Jerry Loeb
**Project Title:** Temperature and Pressure Compensation in the BioTAC Biomimetic Tactile Sensor
**Description:** Our group has designed the BioTAC, a biomimetic tactile sensor. The sensor uses impedance changes in an electrolytic fluid inflated into the BioTAC to derive information about applied forces. I worked on finding the optimal volume to fluid to inflate the BioTAC with to maximize sensitivity and 2) creating a temperature compensating algorithm in the BioTAC, as the electrolytic fluid impedance changes with temperature.

Stephanie Davalos-Segura:
Faculty Mentor: Dr. Francisco Valero-Cuevas
**Project Title:** A control system applied to a motor for the calculus of the grip force dynamics
**Description:** Control the force produced by a DC motor depending on the location of the markers, and when a marker passes through a specific position, the controller apply for an instant a different force and then returns to the initial step.

Joshua Liaou:
Faculty Mentor: Dr. Tzung Hsiai
**Project Title:** Study of Zebrafish Electrocardiogram under the influence of amiodarone.
**Description:** In this research, we analyzed the electrocardiogram of Zebrafish with amputated hearts. By understanding the effects of amiodarone, we observed the functionality of the heart.

Don Tran:
Faculty Mentor: Dr. Tzung Hsiai
**Project Title:** Effects of Arrhythmic-like Flow on Endothelial Dysfunction: An in-vitro Model
**Description:** Atrial fibrillation is the most common form of cardiac arrhythmia, where the heart beats in a disorganized manner, has been correlated to endothelial dysfunction. Here we postulate that shear stress as a contributing factor in this dysfunction since in arrhythmic flow, cardiac output is significantly altered in respect with time, thus playing a role in the phenotypic response of endothelial cells. We utilized a dynamic flow system and biochemical methods to investigate this question.
Listed in order of speakers:

**Christina Yee:**
*Faculty Mentor: Dr. Jay Kuo*

**Project Topic:** Image Segmentation Techniques in Digital Image Processing

**Description:** An image can be processed with different techniques depending on the features which a user wants to extract. For example, the foreground and background of an image can be segmented based on a picture’s grayscale or color properties. But when images contain uniform color schemes, a preferred processing method is segmentation using texture features.

**Dan Russo:**
*Faculty Mentor: Dr. Milind Tambe*

**Project Title:** Distributed Multi-agent Optimization Under Uncertainty

**Description:** I investigated the source of a phenomenon dubbed the "Team Uncertainty Penalty": that increased coordination may hurt performance in a multi-agent optimization problem even when communication and computation costs are ignored.

**Juan-Miguel Ramirez-Rocamora:**
*Faculty Mentor: Dr. Gerard Medioni*

**Project Title:** Gesture-Recognition System for Human-Machine Interfaces using Range Image Data

**Description:** The project focuses on developing a system for gesture recognition in a spatial environment allowing the user to access applications using body and hand gestures. A series of diverse techniques were applied in order to achieve the objectives, such as Dynamic Time Warping and Machine Learning.

**Maneesh Gujarati:**
*Faculty Mentor: Dr. Ellis Meng*

**Project Title:** BioMEMS Drug Delivery Device

**Description:** I will be talking about the background of the drug delivery device project along with the deflection and flow rate testing that I conducted on one of the components of the pump, the bellows. I will also talk about how I tested the flow rates of one of the competing pumps and the results from my experiments.