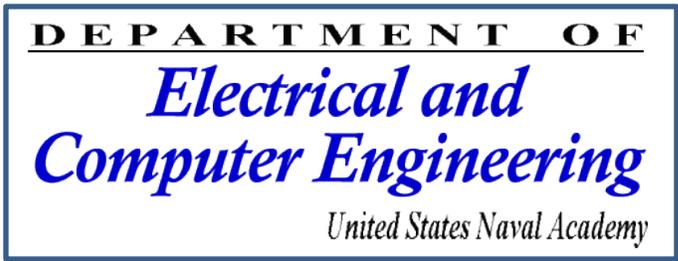


2012 ECE DEPARTMENT CAPSTONE CONFERENCE

Rickover Hall, Room 102
Wednesday, 25 April 2012



0750: INTRODUCTORY REMARKS: DR SAMARA FIREBAUGH

MORNING SESSION



0755

MIDN 1/C Robert Inglis

Securing the Matrix: Wireless Sensor Network Security

The purpose of this project is to develop a limited cyber security system for a wireless sensor network (WSN). Built on the WSN Radio Tomography network designed by previous teams, the system detects and profiles vehicular traffic within the network. The focus is on improving network performance and implementing solutions to network security threats, with an emphasis on encryption, jamming mitigation, node integrity, and network topology. Network testing is conducted on both the base and implemented project code.

0820

MIDN 1/C Ran Song
MIDN 1/C Daniel Vallejos

Eye in the Sky: Facial Recognition for the 21st Century

The United States has found itself increasingly fighting in asymmetric conflicts where the enemy does not stand and fight in a conventional battle, but uses the population to blend in and conduct hit and run strikes. In this battle-field, there is a need for accurate target identification and discrimination. Using commercial off the shelf parts, a lightweight, portable system was developed that recognizes enemy combatants from the air. This system can be expanded to incorporate more advanced parts for actual real life applications.

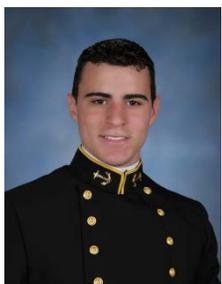


0855

MIDN 1/C Amanda Lowery
MIDN 1/C Mathew McIntyre
MIDN 1/C Christian Soncini, MIDN 1/C Linda Yen

Budget Volt

With most gasoline powered vehicles, every mile driven costs about 36 cents. By comparison, the cost of an electric car is under 10 cents per mile. This project focuses on creating a cheap and economical battery powered vehicle. The Budget Volt uses solar charged batteries to run a motor and all the accessories that would accompany a safe electric vehicle.

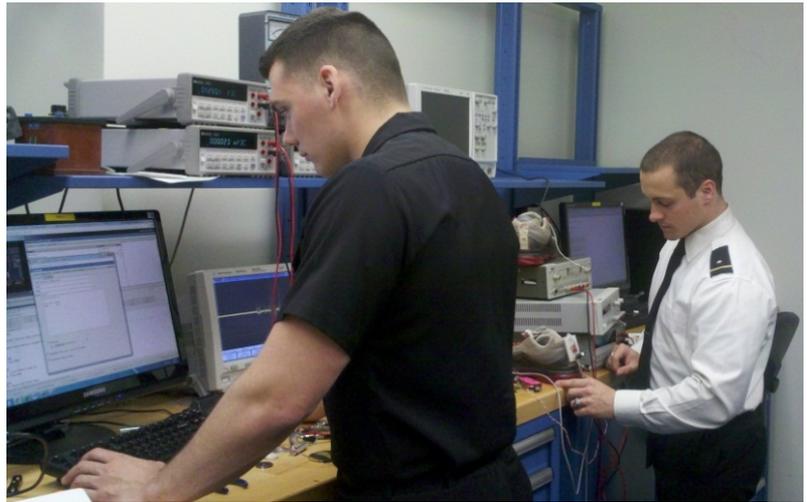


0920

MIDN 1/C Patrick Deane
MIDN 1/C Jason Pratts

Shoe Power

This research focuses on harnessing the kinetic energy of walking or running and using it to charge a small battery. Piezoelectric material is used to generate voltage from the impact of a footstep and an energy harvesting circuit transfers the voltage to a rechargeable battery. This system is designed for small electronics such as hand held GPS devices and cell phones.



0955

MIDN 1/C Robsson Brassea, MIDN 1/C Travis Hack
MIDN 1/C Margaret Herbert, MIDN 1/C Grant Thorne

Jedi Mind Tricks

Electroencephalography is the noninvasive measurement of the brain's electrical activity through external electrodes on the scalp. In the medical and commercial fields there are a number of different options available for EEG's yet most are expensive and inconvenient. This project will explore potential applications of such a headset, starting with its potential to uniquely identify the user.

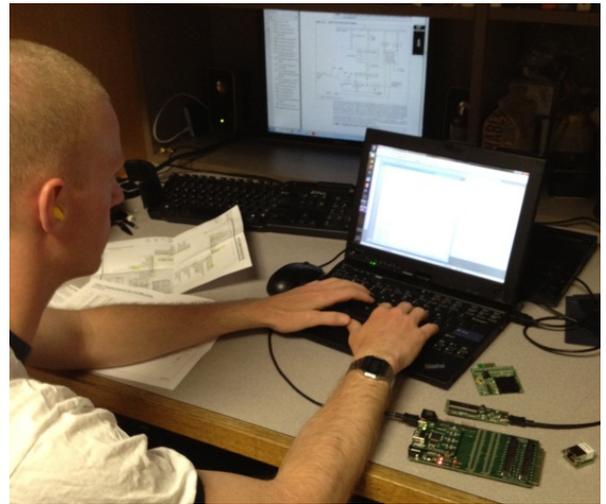


1020

MIDN 1/C Christopher Duffy

ECTOP Digital Unification

This project integrates ten instruments used for the measurement of turbulent statistics. The instruments are interfaced to provide a variety of benefits, most notably synchronization and data management. The interface utilizes COTS Microchip products to provide serial communications in the R2-232 and SPI protocols, all ultimately contained in a pressure housing to be deployed with the ten instruments underwater. Instrument data is then logged via a main controller to an SD card via the FAT32 interface. At the surface, a user can interact with the instruments and memory via the main controller using the Ethernet protocol.



1055

MIDN 1/C John Gale, MIDN 1/C David Hoyle

Too Hot to Handle

With improved smartphone and tablet technology, it is becoming increasingly feasible to implement powerful biometric recognition algorithms on portable devices. This research focuses on trying to improve the energy efficiency of these algorithms, making them faster and thereby reducing the amount of energy required from the battery. We specifically look at the differences between integer and floating point math, Java and C-code, as well as different loop optimization techniques. Substantial savings in energy could result if some of these changes were implemented on existing biometric algorithms.

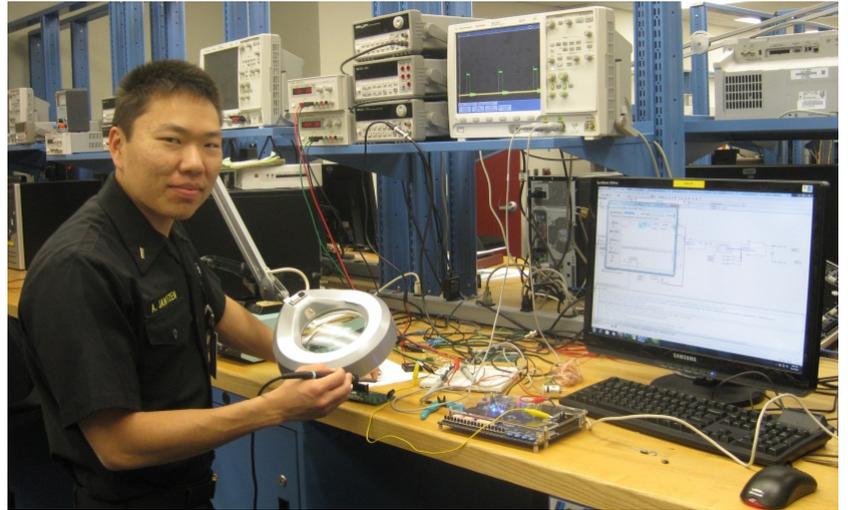


1120

MIDN 1/C Anand Jantzen

Motor Control Through Power Electronics

This project focused on designing and creating a DC motor control system using power electronics to demonstrate the conversion of electric energy to mechanical energy. The system was comprised of three parts: controller, power electronics circuit board, and a motor. Design focus was on making the printed circuit board small using surface mount components.



**1145-1230 LUNCH/MOVIE MARATHON
FOR 1/C AND 2/C ECE MAJORS
AFTERNOON SESSION**



1230

MIDN 1/C Tyler Trombetta

MIDN 1/C Sunny Tsao

Surveillance and More Drone

The goal of this project was to design and successfully build a small flying drone that can fly above the battlefield and track people or vehicles on the ground. It provides real-time video and drone data to a user on the ground and highlights the people or vehicle it is tracking. The drone will track the target and follow it autonomously.

1255

MIDN 1/C Adam Goetz

Optical Switching Using High-Resistivity Silicon: Enhancing RF Communication and Optical Sensing

This research examined optical switches made from high resistivity silicon and their potential application with microstrip structures. The project focused on the fabrication, integration, and testing of these optical switches. Conductive and non-conductive silicon states were observed during proof of concept testing. An optical switch was also integrated in a 5GHz patch antenna and the antenna behavior observed when 975nm and 1060nm light was applied to the switches.





1330

MIDN 1/C Nicholas Peskosky
MIDN 1/C Joshua Engle

Application of Polymer-Based Light Emitting Diodes to Optically Stimulated Neural Response Measurement

Silicon probes containing lithographically-patterned microelectrode arrays have facilitated the high-density recording and stimulation of the brain for both neural research and therapeutic applications. Current neural probe fabrication technologies are limited by the need for external coupling of optical power into the device. A novel blue-emitting polymer light emitting diode (PLED) was synthesized for use in conjunction with neural probe applications. The production of a physical device was complemented with a COMSOL based finite-element model of the thermal gradient associated with an implanted device.

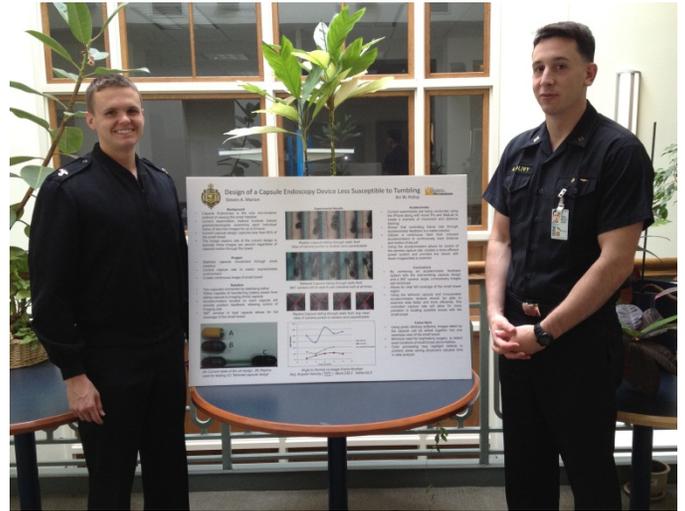
1355

MIDN 1/C Steven Marion
MIDN 1/C Ari Polivy

Design of a Capsule Endoscopy Device Less Susceptible to Tumbling

Capsule endoscopy is currently the gold standard method for diagnosing the cause of obscure GI tract bleeding subsequent to endoscopy, and can be used for the diagnosis and monitoring of conditions such as Crohn's disease, Celiac Disease, and small bowel cancer. The procedure is also undergoing FDA approval for use in the colon. A drawback to the current system is the amount of time it takes the physician to review the images. This task is complicated by the unpredictable motion of the capsule as it tumbles longitudinally due to the peristaltic flow and complex environment of the intestine.

This work proposes a new capsule design that should be less susceptible to tumbling behavior. Initial results are presented demonstrating greater stability for the tethered pill in a system that simulates the fluid environment of the small intestine.



1430

MIDN 1/C Praveen Murthy
MIDN 1/C John Tortorich

Modeling a Tidal Turbine's Power System

Tidal energy is a green energy source that is becoming more and more popular due to its clean emissions and low cost. The goal of this project is to model a tidal turbine power system that can power a moderately sized client by simulating the turbine with a motor, choosing a generator that matches a turbine's characteristics, creating a resistive load that controls the amount of torque and rotation the turbine can have, choosing an effective dump load controller, and maintaining high efficiency while generating electrical power.

1500: POSTER SESSION