ECE 4899 Final Review Presentation/Demonstration Schedule

Friday May 10, 2013
EN 101 8:00 AM – ~1:15 PM (lunch provided)

8:00–8:15 AM
Team: Michael de Graaf, Kelsey Thorson, and Robert Chavez
Title: BLE Prototypes for Interface Testing with an iOS Device
Sponsor: Sponsored by Bob Kressin UCCS ECE Department
Advisor: Professor Tekamp and Dr. Wickert

Description: Since October 2011, mass market mobile devices have started including Bluetooth Low Energy chipsets. The growth of the Bluetooth Low Energy chipset and the abundance of cell phones with BLE capabilities offer a substantial opportunity for hardware and device manufacturer, fueling the use of wireless sensor arrays in consumer applications.

In order for hobbyists’ innovation to gain entrance into the evolving mobile device market, access to many different hardware components is vital. Assuming that profit is the motivating factor of the hobbyist and an application is the end product, time spent developing hardware is directly proportional to costs incurred. A better time-management and cost-effective strategy is to spend it on creative integration of modular hardware components (sensor arrays).

The purpose of this project is to create two Bluetooth Low Energy prototype products, to characterize key performance metrics of the products, and to wirelessly connect the products to an Apple iOS-based device. These products will offer a platform to integration of different components on a larger scale..

8:30–8:45 AM
Team: Abin Muckom, Rick Dowdle, Justin Bobo, and Jason Morrissey
Title: Micro Position Controller
Sponsor: Sponsored by Shielding Integrity Services, Colorado Springs.
Advisor: Dr. Wickert

Description: The main objective of this project is to create a microcontroller-driven system that can be used to drive an automatic probe or antenna in anechoic chambers. The drive system should be compact, shockproof, and portable. When the system is operating, its purpose is to control the probe positioner. The system is used to measure performance of these chambers both by commercial and government users. Fully anechoic chambers are used to design antennas and measure radar cross...
sections; semi-anechoic chambers are used to measure electromagnetic interference potentially generated by commercial electronic devices.

This design project is provided by Shielding Integrity Services (SIS), which is a local company founded in 1988. They test all types of radio frequency shielding, semi-anechoic chambers, fully anechoic chambers, and open area test sites on a worldwide scale.

9:00–9:15 AM

**Team:** Kenneth Hassey, Danny Dauwe

**Title:** Verilog Linting Tool

**Sponsor:** Sponsored by Dr. Greg Tumbush, UCCS ECE Department, Colorado Springs.

**Advisor:** Dr. Greg Tumbush

**Description:** The ECE 4242 Advanced Digital Design Methodologies course as well as several other courses at University of Colorado at Colorado Springs teach students about digital design techniques and place emphasis on the Verilog hardware description language. The students learn syntax needed to code in Verilog, as well as methods to simulate their code. They also learn how to synthesize their code to a gate level schematic for ASIC and FPGA devices. However, because simulation and synthesis are separate the simulation design may not be synthesizable into gate level logic.

This is a problem for ECE 4242 students because these students find that after writing Verilog code for a specific assignment their code is not realizable. This causes the students to redo their assignment, and/or change their coding style to ensure success in future assignments or work.

9:30–9:45 AM

**Team:** Aaron Danielson, Robert Mann Randall, and Newcomb Scott Russell

**Title:** Class-D Garage Band Amplifier

**Sponsor:** Dr. Nigel Thompson, Real-Time Logic, Colorado Springs, CO.

**Advisor:** Dr. Harrison

**Description:** The typical guitar amplifier available in today’s market is inefficient, bulky, and expensive. However, class-D type amplifiers are more efficient, more compact, and unfortunately, more expensive. This project is to design and build a low cost class-D amplifier using a low-cost, commercially available FPGA using a switching H-bridge output stage.

When buying a guitar amplifier, the typical guitar player is faced with a dilemma: either choose a low-power, inefficient amplifier because of budget constraints, spend a lot of money on a typical high-power amplifier which is usually inefficient and generates a large amount of heat, or be prepared to spend a small fortune on a quality class-D amplifier - which
can be designed to generate much less heat, be far more power efficient, and is quite compact in comparison to class A/B amplifiers with similar power handling capabilities. Class D amplifiers can also produce higher output power than class A/B amplifiers, given the same supply voltage.

10:00–10:15 AM

Team: Collin Mast, Cory Mast, Carl Christensen, and Andrew Greene
Title: Energy harvesting Bluetooth Low-Energy Wireless Sensor Network
Sponsor: Sponsored by EM Microelectronic, Colorado Springs.
Advisors: Dr. Wickert
Description: The current problem facing wireless sensor networks is their power limitations as well as problems with using RF. The current models using RF require the receiver to be within close proximity as well as have a computer interface since the current production of phones don’t include any way to interface with the numerous different RFID transmitters that are on the market today. Even the current available BLE radios require a battery. An ideal device would be able to use energy harvesting to collect energy from the outside world and be able to store it to use during times when the energy harvester is inactive. This means that the current BLE radio configurations need to be controlled by just the power provided from the energy harvester and the battery when the harvester is not receiving any input energy. Finally, the solution should be able to access the data from the BLE receiver already implanted inside the latest smartphones.

10:30–10:45 AM

Team: Will Fangmeier, Joel Fassbender, and Evan Hopper
Title: Electronic Bird Deflector Device
Sponsor: Sponsored by Fluke Networks, Colorado Springs, CO.
Advisor: Professor Tekamp
Description: Birds, while often beautiful to observe and generally non-destructive, can be an obnoxious pest to homeowners. While many birds nesting near homeowners are often unnoticed, there are certain nesting locations on or near a home that can be both destructive to the home and unsightly. Some examples of these locations include above the front door, in gutters, dryer vents, or in holes pecked into the siding of a home.

Because some birds can be a nuisance, there is a market for bird deterring systems. While there are already many different bird deterring systems already on the market, most of them are pricey or use audible deterrent frequencies that are not in the frequency range of a bird’s hearing. Therefore there is a need for a cheap, compact, and effective system.

11:00–11:15 PM
Break: A short break. This time will also be used for ECE 4890/4899 students to fill out FCQs, ECE exit questionnaires, and lastly final demonstration last minute preparation.
11:15–12:45 PM  **Project Demonstrations:** The evaluator team (faculty, sponsors, and approved others), visitors, and 4890 students, will observe the project demonstrations in various ECE labs. The specific ordering of the lab visits will be discussed prior to the break. Stayed tuned. Lunch will follow the demonstrations.

**Demo Schedule:** The plan is described in the table below.

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<td>Energy harvesting Bluetooth Low-Energy Wireless Sensor Network</td>
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12:45–1:15 PM  **Lunch:** The ECE department will provide lunch for all 4890/4899 students, faculty, and sponsors. The lunch will be served in EN 239 (the seminar room near the vending machines).