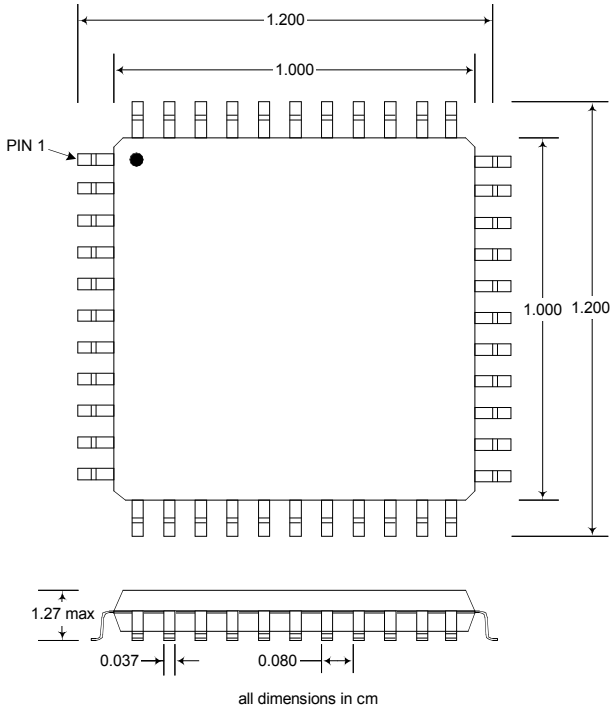

ELECTRICAL AND COMPUTER ENGINEERING SENIOR DESIGN DAY

Friday, May 1, 2009

Electrical and Computer Engineering Department
The University of Connecticut

www.ee.uconn.edu/SeniorDesign

Spring 2009 Senior Design Projects

Demonstrations in the ITE Building (C19 and Concourse)

Bio-Imaging I: Ultrasonic Pulse Generation and Transmittance

Lee Chong (EE), Dan Mallek (EE), David Thieken (EPHY), Daniel Vontell (EE)

Current ultrasound systems lack user friendly interfaces that allow the users to vary parameters such as the frequency, amplitude, duty cycle and delays between the pulses in transmission. Our objective in this project is to implement an interface that allows the user to have greater control over the ultrasound transmission by making it possible to vary the parameters mentioned above. The project involves using the LabVIEW software to implement new features into the interface so that the ultrasound hardware can be manipulated to a greater degree. The outcome of this project an improved ultrasound interface that makes the transmitted ultrasonic waves much closer to the specifications desired by the user.

Sponsor: ECE Advisor: Q. Zhu (ECE)

Bio-Imaging II: Ultrasound Receiving System

David Baker (EE), Marshal Mathew (EE), Kevin Romeo (EPHY)

Our objective is to form an ultrasound image. Our approach is to use an amplifier and filter network to prepare the signal for an A/D converter, capture the logic stream from the A/D converter using a logic analyser, and form an image by processing the raw data in Matlab. This system can provide the receiver portion of an inexpensive ultrasound test instrument.

Sponsor: ECE Advisor: Q. Zhu (ECE)

Localization for Underwater Sensor Network

John Botticello (EE), Patrick Carroll (EE), Sherwayne Gordon (EE), Ryan McDermott (EE)

The goal of the project was to produce a functional method of spatially locating an underwater node using acoustic communication methods. The problem was approached by using four surface buoys transmitting a coordinated signal train. Based on the received signal, the receiver infers the approximate distances from four buoys, and then determines its own position. Hence, an ``underwater GPS'' concept is demonstrated. The transducers and interfacing boards for acoustic transmission were provided by APS, and the modems for baseband signal processing were provided by UCONN's Underwater Sensor Network Lab.

Sponsor: Applied Physical Sciences Advisor: S. Zhou (ECE)

UConn Personal Automatic Test Equipment

Elvis Anes (CMPE), Jeff Chua (CMPE), Ali Faraz (EE), Samantha Logue (CMPE)

Today's commercial testers are large and expensive and usually operate 24/7 for manufacturing testing of large volume ICs and are not normally available to design-for-test (DFT) and debug engineers to perform diagnosis on failing chips or returned parts, We designed a small personal functional tester with the flexibility of adding structural test in the future that performs functional testing that the average DFT Engineer can use at his desk at his own time. Our design uses a LabVIEW program to generate test cases which are sent to a microcontroller via RS-232. The microcontroller processes the data and sends it to an FPGA. The FPGA then applies the data to a design under test (DUT) and sends the results back to the microcontroller to be sent back to the PC for processing. LabVIEW then determines weather the results from the test were correct.

Sponsor: ECE Advisor: M. Tehranipoor (ECE)

Digital Temperature Controller

Colin Gladding (EE), Harpreet Mankoo (EE), Joe Mascola (EE)

Surface acoustic wave (SAW) devices are analog signal processing microcircuits which require stable temperature conditions for predictable functionality, and which are typically employed in aerospace applications. Our team, sponsored by Phonon Corporation, has designed and constructed a digital temperature controller device which improves on Phonon's previous-generation device with single-wire programming and precise PID temperature control, while still operating on a minimal four-pin footprint. This design no longer requires expensive and time-consuming alterations of the physical circuit whenever new settings are desired; rather, it facilitates serial digital programming through the controller's existing power supply pin.

Sponsor: Phonon Advisor: M. Tehranipoor (ECE)

SunTracker

Peter Bowden (CMPE), Andrew Gumkowski (EE), Marianne LaRosa (EE), Fred Willkins (EE)

With today's current trend of rising energy costs, and the looming threat of global warming, the need for alternative energy sources has been on a constant rise. One obvious and ever-present source is the sun, but even the most advanced technologies are only yielding 20% efficiency. The objective of this project is to increase the amount of energy gathered by utilizing reflective material in a solar collector, which is less expensive than adding additional solar panels. The solar collector constructed for this project is the Golden PentaBeam, a patent pending design by Dr. M. Fox that can provide up to 3.24 times the amount of energy gathered by the solar panels using five pentagonal reflectors. Active tracking uses a series of photoresistors and a microcontroller which can be used with the PentaBeam to provide an additional increase in the amount of energy gathered by the solar collector.

Sponsor: ECE Advisor: M. Fox (ECE)

Electric Car

Adnan Abdulally (EE), Jan Khan (EE), Brian Poeltl (EE), Matthew Shakun (EE)

The electric car drive train group is responsible for making a cost effective 3 phase AC electric car drive train. This is done by modifying a car alternator to act as a 3 phase AC motor. This is a very scalable approach, allowing for many alternators to be connected by a common drive shaft. The alternator is driven by a control circuit, which comprises a PIC16 microcontroller, an NMOS driver circuit, and a power FET H-bridge setup. The H-bridge setup is powered by 4 car batteries, which output the 3-phase signal required to power the alternator and make it spin as if it were a motor. The PIC16 provides a stepper motor input signal, while the NMOS driver circuit steps up the voltage of the PIC16 signals so that the power FETs can be driven properly. An alternator proves to be a powerful 3-phase AC motor, which is scalable to allow for the right power needed to drive the car. The controller is very cost effective and the combination is a great alternative to buying an actual 3-phase AC motor.

Sponsor: ECE Advisor: M. Fox (ECE)

Mobile Guided Troubleshooting

Brendan Bartoli (EE), Jason Ramnarain (CMPE), Jenna Whalen (CMPE)

Qualtech Systems, Inc. (QSI) is a company that supports the troubleshooting of other corporation's large, complex systems (such as planes or software applications). Our Senior Design team is implementing one of QSI's most used software applications, TEAMS, for mobile device use. The TEAMS application parses XML files and instructs the user how to pinpoint the faults on a system being tested and debugged. We are not only implementing the TEAMS functionality, but also developing a Graphical User Interface for ease of use. The application runs on the Windows mobile platform.

Sponsor: Qualtech Advisor: J. Chandy (ECE)

Aircraft Network Enabled Weather Probe

John Daley (CMPE), Ronald Leask (EE), Ian Lee (CMPE)

NCPS research headed by Dave Loda sponsors the project in collaboration with the FAA and NASA. This project demonstrates an aircraft as a node in an HTTP network. The implementation consists of multiple data sensors (temperature, humidity, vibration, and GPS) that log data into a database and display the data via a web interface. The data sensors connect to a micro-server that is connected to the internet and displays the aircraft's data in real time. The server connects to the internet via LAN, cellular, or Iridium communication.

Sponsor: NCPS Research Advisor: J. Chandy (ECE)

Marine Sensors

Matt Tarca (EE), Dave Zhao (EE), Elias Zraik (EE)

Our system is designed to emulate the internal communications of a marine sensor system. The system consists of numerous types of sensors, each group of sensors existing at multiple points within the system (representing nodes existing at multiple depths in the real implementation). Also, each sensor is automatically evaluated to determine if is operating normally, and when determined to be bad is replaced with a new sensor via a linear actuator. To demonstrate these concepts, we will collect 2 types of sensor data (temperature and humidity) at two distinct locations, each of which will put the information into a user friendly format and transmit it through our communications system to a nearby PC. A sensor failure will be simulated by wetting a humidity sensor. At this point the system should automatically detect the failure and replace the sensor.

Sponsor: ECE Advisor: R. Bansal (ECE)

Output Breaker Design

Alfredo Flores (EE), Surabhi Gupta (EE), Brian Saitta (EE)

Our team was sponsored by Dominion Millstone Power Station to start the design process for installing a main generator output breaker on Unit 2 of the station. We created a bid specification document that covers in detail Dominion's requirements for the breaker. We also researched potential companies who manufacturer high voltage circuit breakers and eventually decided on a single vendor. Lastly we analyzed affected drawings and schematics that need to be modified when the breaker is installed. Overall this project was very different from most but very challenging and required us to learn about the nuclear power industry.

Sponsor: Dominion Millstone Nuclear Advisor: R. Bansal (ECE)

You're Invited

The Electrical and Computer Engineering Department would like to invite you to the Spring 2009 Senior Design day to be held at the University of Connecticut on Friday, May 1, 2009 from 2:00 PM to 5:00 PM.

You will have the opportunity to tour the Senior Design Lab and view demonstrations of projects completed by the Senior Design students.

Directions

Directions: Interstate 84 to Exit 68. Route 195 south. Descend hill into University of Connecticut and follow the signs to South Garage. *[Take the first right after mirror lake (Mansfield road). Take the second left (Gilbert Road). At the end of Gilbert Road turn right onto Hillside Road. Parking is available in South Garage, on your left.]* From South Garage, take a left onto Hillside Road and a right onto Fairfield Way. The Information Technologies Engineering (ITE) Building is the second building on the right of Fairfield Way, located between the School of Business and the Library. Please contact Prof. Rajeev Bansal at (860) 486-2878 if you have questions.

About ECE Senior Design

Computer and Electrical Engineering Design I and II is a two semester design sequence (ECE 4901/CSE 4951 and ECE 4902/CSE 4952) taken by all senior Computer Engineering and Electrical Engineering students at the University of Connecticut.

The course objective is to provide an opportunity for students to apply their engineering knowledge to solve open-ended design problems using a multidisciplinary team approach.

Students work in teams of three or more students. Each team is multidisciplinary in nature. This is normally accomplished by including students from different programs (EE, CMPE, and ME). In some cases, all participants on a particular team may be from the same program. In such a case, team members are chosen such that the members have different concentrations, expertise, or strengths.

Thanks to Our Sponsors

Applied Physical Sciences, Dominion Millstone Nuclear, NCPS Research, Phonon Corp., Qualtech Systems

http://www.ee.uconn.edu/SeniorDesign