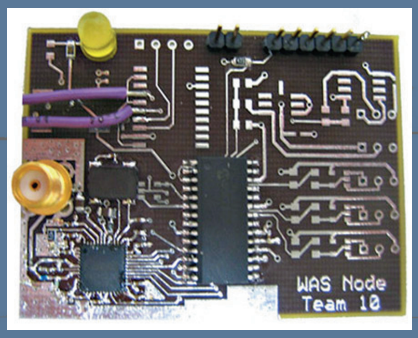
MICHIGAN STATE
UNIVERSITY



December 8, 2005

Electrical and Computer Engineering

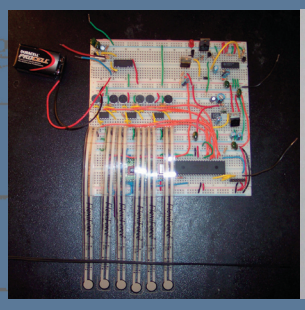
Design Day

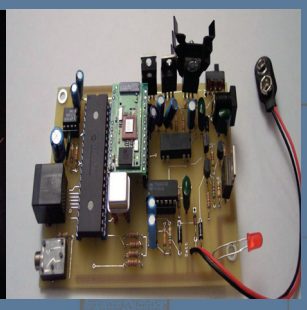
Featuring student design projects from ECE 480, EGR 291
and co-op/internship presentations

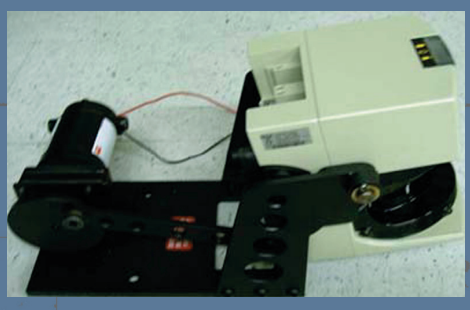
9:00 a.m. - 5:00 p.m.
In the MSU Center for International Programs (CIP)

Displays and competitions in Spartan rooms B & C off Crossroads Cafeteria
Oral Presentations - 3rd floor CIP

6:00 p.m.
Awarding of PRIZES - 3rd floor in room 303 CIP







Senior Capstone Design Course

For All Electrical Engineering or Computer Engineering Majors at Michigan State University

Prepares students for the workplace, or for graduate school, including:

- *Putting into practice* the technical skills learned in the classroom, on industrially sponsored team projects, under faculty guidance, **doing open-ended design**
- Giving them experience in teamwork, project management, product life cycle management, legal, intellectual property, and accommodation issues, entrepreneurship, and other skills for the workplace. Each student has two roles on the team – a **technical role** and a **non-technical** role (manager, webmaster, document coordinator, presentation coordinator, or lab coordinator).
- Polishing their communication skills – individual and team – on proposals, reports, resumes, evaluations, posters, web pages, and oral presentations
- Challenging them to analyze and write about issues in engineering ethics and professionalism
- Requiring each individual to demonstrate competency in the lab by:
    - Building a digital circuit from discrete components
    - Building a microprocessor-based device, including programming and interfacing to the microprocessor
    - Programming a digital signal processing (DSP) chip for filtering
    - Writing a graphical user interface program

The Prism Venture Partners Prize

Recognizes the most outstanding capstone design projects each semester, including cash awards for members of the top three teams. Created by MSU alumnus Bill Seifert, of Prism Venture Partners in Boston, the prize is awarded at ECE Design Day by judges from industry who watch the teams' presentations, question the teams, and examine the prototypes.

About the Cover

Front cover shows some of the prototypes created by prize-winning teams in ECE 480, spring, 2005. The traces on the oscilloscope at top left are from the radio-frequency comb generator designed for Robert Bosch by the team that won the Prism Venture Partners First Prize. Top right is the printed circuit board created by the Wireless Automotive Sensor team, which won Second Prize. Third Prize was a three-way tie, with prototypes displayed across the bottom. At left is the hardware built to evaluate the control panel on a microwave oven for accessibility by persons with disabilities. The next two photos are circuitry for the wireless chordic keyboard created to assist a person with cerebral palsy in providing input to a speech synthesizer. That project and the previous one were supported by DaimlerChrysler. The final picture shows the lidar ranging system being adapted for NASA Goddard to produce 3-D range images for the technology demonstrator robot ECE 480 students are building.

Schedule

ECE Design Day, Thursday, December 8, 2005
MSU International Center (CIP), N. Shaw Lane

9:00am – 5:00pm, Spartan B & C Rooms (off main dining area):
ECE 480 students display their posters, prototypes – Open to the Public

9:00am – 5:00pm, 303-304 CIP (third floor) – Open to the Public:
ECE 480 final oral presentations (30 min. each): Team Name, Sponsor:

9:00am: Team 11, "Safe-Warn System," Lear Corp.
9:30am: Team 7, "In-Situ Power Generation for Lighted Aircraft Banner," Sennetech
10:00am: Team 12, "Passive RFID Seat Belt Latch Detector," Lear Corp.
10:30am: (break, refreshments served)
11:00am: Team 4, "Electronic Triggering for Fireworks," Ace Pyro, Inc.
11:00am - 3:00pm: Graduating ECE co-op and intern posters and talks, 305 CIP
11:30am: Team 3, "Redesign of Robot Arm and Docking Maneuver," NASA Goddard
11:30am: EGR 291 robotic arm competition starts in Spartan B&C Rooms
12:00pm: Team 5, "Audio Exercise Machine Transmitter," DaimlerChrysler, MSU ALL
12:30pm:(lunch break, subs and pop available on third floor, International Center)
1:30pm: Team 10, "Wireless Endoscopic Video System for Running Horse," MSU CVM
1:30pm: EGR 291 robotic arm competition continues in Spartan B&C Rooms
2:00pm: Team 2, "Improved Robot Position/Orient. Sensing/Control," NASA Goddard
2:30pm: Team 6, "Audio Exercise Machine Receiver," DaimlerChrysler, MSU ALL
3:00pm: (break, refreshments served)
3:30pm: Team 9, "Wireless Robotic Fish as Sensor Platform," SPIE – Optics Society
4:00pm: Team 1, "Improved Robot Terrain Navigation," NASA Goddard SFC
4:30pm: Team 8, "New Exhibit for Simple Machines Gallery," Impression Five Museum

11:30 - 12:30 and 1:30 - 2:30, EGR291 robotic arm competition, Spartan B & C Rooms, International Center

5:00pm – 6:00pm: ECE 480 industry judges deliberate; free pizza/pop for all engineering students, faculty, and staff – third floor, International Center

6:00pm, 303-305 International Center: Prism Venture Partners Prizes awarded to the top three Senior Capstone Design Project teams

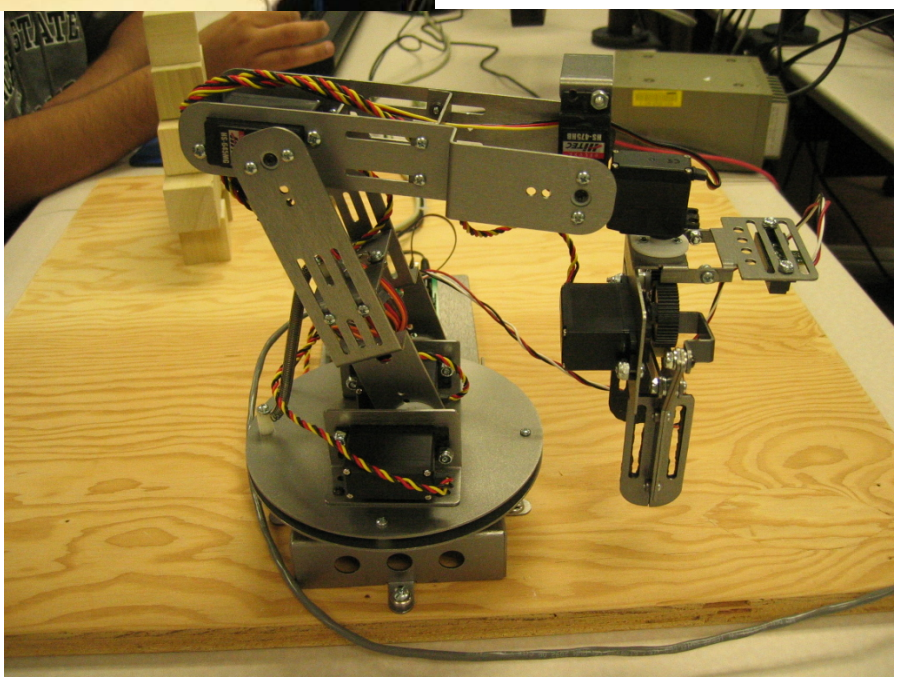
EGR291—FRESHMAN/SOPHOMORE SEMINAR SERIES

Instructor: Peter L. Semig Jr.

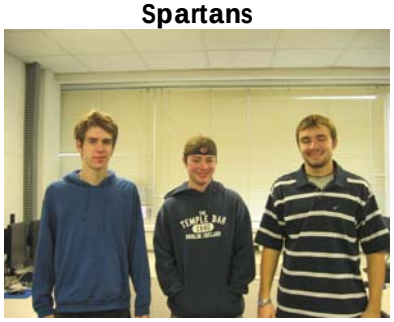
The purpose of EGR291 is to expose freshmen and sophomore students to the areas of Electrical & Computer Engineering through a series of guest lectures and hands-on laboratory experiments. Some of the guest lecturers include: Mr. Jim Novak (resumes & interviewing), Niki Sancimino (Texas Instruments), Dr. Dave Fisher (police radar), and Dr. Ed Rothwell (introduction to ECE). Students gain their hands-on experience through weekly Basic Stamp microcontroller-based lab assignments.

When the required lab assignments have been completed, students are teamed and must develop an algorithm and code for a robot competition. For this fall semester, the task each team must perform is to program a robotic arm to construct a pyramid.

The group completing the construction in the least amount of time wins the competition and has their names engraved on the perpetual plaque of EGR291 winning teams.



EGR291 STUDENT TEAMS, FALL, 2005

Squirrel Avengers  Alex Esbrook, Joshua Dubois	**Liquid Fusion**  Jonathen Brier, Dan West	**Triple Threat**  Marc Dubowski, Kevin McGrail, Nathan Kelly
The Ashen Engineers  Becca Wahmhoff, Stephen Sutara	**Red Wings**  Josh Oleszczak, Chris Ezop	**Team Rocket**  Evan Haggerty, Kunaal Verma, Stephen Cote
Poison  Albert Alexander, Thomas Morrisey	**It**  Aaron McCloy, Kenneth Kleszcz	**Team Ramrod**  Brad Lake, David Kozlowski
Spartans  Dan Labrie, Eric Hosey, Chris Ford	**Team One**  Rachel Bouserhal, Jamie Jacobs	**JAS Inc.**  Jonny Fabro, Sarah Pardee, Andrew Babel

Students not pictured: Dilo Benjamin, Kyle Bartush, Jonathan Walby.

See the teams compete in SPARTAN B & C Rooms, International Center, beginning at 11:30am and 1:30pm

CO-OP AND INTERNSHIP PRESENTATIONS

BRAND NEW POLICY: ECE students may earn academic credit, usually one credit per experience, for internships, co-op placements, independent study, undergraduate research experiences, and/or study abroad (excluding formal classroom instruction abroad treated as equivalent to MSU courses). In addition, a set of 3-4 of these experiences may substitute for one of the major elective courses required for graduation. To make this substitution, all of the experiences proposed for this substitution must have been pre-approved for credit and all reporting requirements must have been satisfied and approved by their assigned faculty mentor.

Faculty Mentors for the 2005-2006 School Year:

Dr. Selin Aviyente – Systems (Communication & Signal Processing)
Dr. Timothy Grotjohn – Electrosciences (Electronic Materials)
Dr. Leo Kempel – Electrosciences
Dr. Tongtong Li – Systems (Communication & Signal Processing)
Dr. Robert McGough – Systems (Biomedical & Controls)
Dr. Rama Mukkamala – Systems (Biomedical & Signal Processing)
Dr. Karim Oweiss – Systems (Biomedical)
Dr. Pradeep Ramuhalli – Elecrosciences & Systems (Non-Destructive Evaluation)
Dr. Peixin Zhong – Computer Engineering (Computer Architecture & Networks)

Faculty Mentors meet with the student to advise on selection and outcome of the experience; assist with preparation and evaluation; monitor student progress; conduct site visits; and evaluate final student outcomes through papers, posters, presentations and other documented outcomes.

As part of the outcome assessment of this experience, all graduating seniors and /or students that have completed 3 or more experiences are asked to complete a presentation on their experiences at ECE Design Day. These presentations are developed in collaboration with their faculty mentors.

Students presenting today completed assignments at the following work sites:

Control Systems, Inc. – Lansing, MI
Cook Nuclear Power – Buchanan, MI
Daimler Chrysler – Auburn Hills, MI
Dow Chemical – Midland, MI
Fraunhofer, USA – East Lansing, MI
General Electric Aircraft Engines – Cincinnati, OH
General Motors – Warren, MI
IBM – Fishkill, NY
Motorola – Rolling Meadows, IL
NECC – Troy, MI

CO-OP AND INTERNSHIP PRESENTATION SCHEDULE

305 International Center

11:00 am – 3:00 pm, December 8, 2005

The **tentative** schedule is as follows:

11:00	Jacey Marushia-Laurain (McGough)	Cook Nuclear
11:20	Michael Dapra (McGough)	GE Aircraft Engines
11:40	Anthony Wadnal (Ramuhalli)	General Motors
12:00	Jeremy Anderson (Li)	Motorola
12:20	J. Ross Hamilton (Zhong)	IBM - Fishkill
12:40	Bobby Flotkoetter (Ramuhalli)	DaimlerChrysler
1:00	Syed Ahmed (Grotjohn)	Fraunhofer USA
1:20	Ben Sabadus (Aviyente)	NECC
1:40	Rafat Elahi (Mukkamala)	Control Systems Inc.
2:00	Tony Skarich (Aviyente)	Dow Chemical

Each presentation is scheduled for 15 minutes. All are open to the public.

Here, an MSU student talks with employers at Career Gallery in MSU's Breslin Center, Oct. 5-7, 2005. Many companies interviewed students for full-time, internship, and co-op positions. Attendance was at a record high!

Electrical and Computer Engineering
Michigan State University

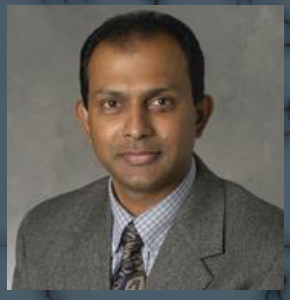
ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #01
"Improved Terrain Navigation Capabilities"

www.egr.msu.edu/classes/ece480/goodman/fall/group01/

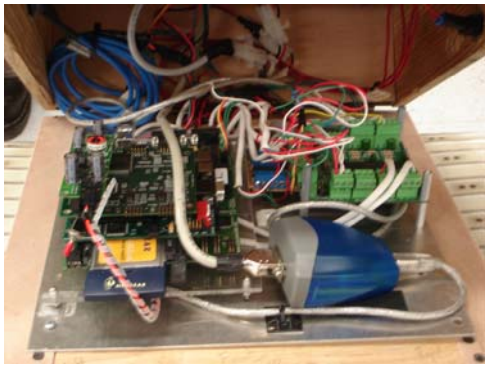
INDUSTRIAL SPONSOR
NASA Goddard Space Flight Center

SPONSOR CONTACT
Mr. Mike Comberiate

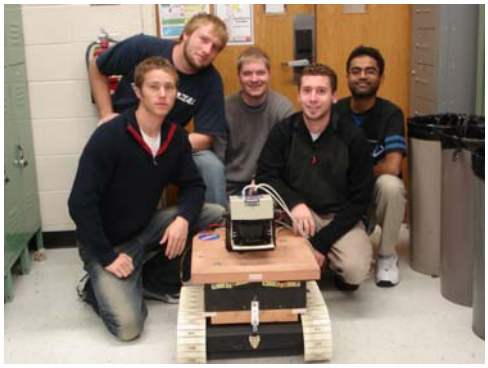


Prof. Nihar Mahapatra
Faculty Facilitator

IMPROVED TERRAIN NAVIGATION CAPABILITIES

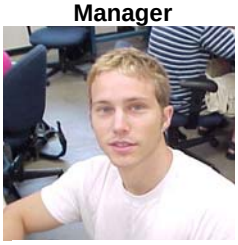


Team 1 was tasked to advance the navigation capabilities of a NASA-sponsored robot being developed at MSU, improving its ability to determine its location on an unknown terrain. The team addressed the challenge from two directions: 1) creating a system of three transceiver-equipped beacons that repeat back a radio signal received from the robot (the round-trip time of the signal is used by the robot to calculate its distance from each beacon and ultimately triangulate its position relative to the beacons), and 2) using the existing SICK LIDAR unit to detect visual cues on each of the beacons. Once the beacons are located, the robot can calculate its position using range information available from the LIDAR image. Combining the information gathered from these sources allows the robot's software to make intelligent decisions about its location relative to the three beacons. This improved position information will enable existing navigation software created by previous teams to create a 3D topographical map of the terrain the robot is exploring.



Oral Presentation: 4:00pm

Manager



Jason Malinak

Webmaster

Paresh Patel

Doc. Prep.

Jacob Swary

Present. Prep.

Michael McCullough

Lab Coordinator

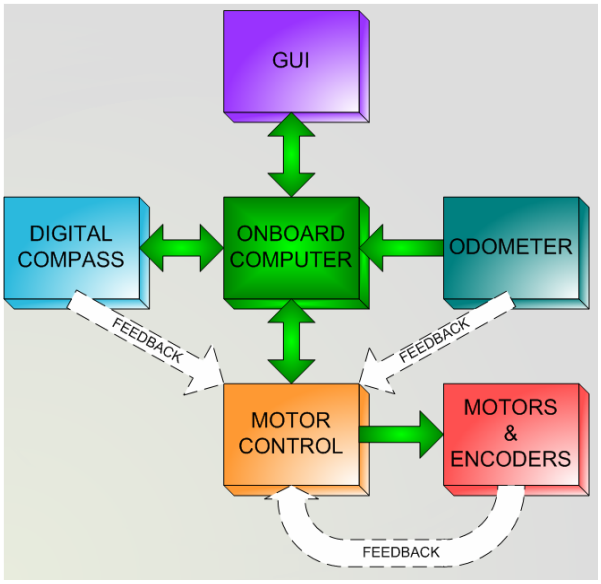
Anil Ali

Liaison

Christopher Ziel

IMPROVED POSITION / ORIENTATION SENSING AND TRACK MOTOR CONTROL

Team 2 was given the mission of creating a high-resolution motor control system for the NASA robot technology demonstrator platform being built at MSU. The detailed data available from the shaft encoders on the track motors is fully utilized in the new software and control system. The previous motor controller board has been redesigned to use the encoder data, providing more accurate and sophisticated motor control. A digital compass with tilt compensation has been integrated to provide feedback to the motor control system to allow for more accurate turning and to provide measurements of pitch and roll. An odometer wheel has been installed independent of the drive system and is used to help determine the actual distance traveled by the robot, regardless of track slippage. Position and orientation data are sent wirelessly to a custom navigation GUI (graphical user interface). The robot is capable of traversing a course, given a set of navigation commands, without the need for expensive vision gear and sensors. Accurate positioning and travel is required for the success of many other applications of the robot, including 3-D topography stitching and docking maneuvers.



Oral Presentation: 2:00pm

Manager

Tim Alley

Webmaster

Douglas Hines

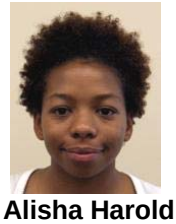
Doc. Prep.

Roy I Pierce II

Present. Prep.

Joseph Warbington

Lab Coord.



Alisha Harold

Electrical and Computer Engineering
Michigan State University

ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #02
"Improved Position / Orientation Sensing and Track Motor Control"

www.egr.msu.edu/classes/ece480/goodman/fall/group02

INDUSTRIAL SPONSOR:
NASA Goddard Space Flight Center

SPONSOR CONTACT:
Mr. Mike Comberiate

Prof. Fathi Salem
Faculty Facilitator

Electrical and Computer Engineering
Michigan State University

ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #3
"Redesign of Robot Arm and Docking Maneuver"
(NASA Goddard Space Flight Center)

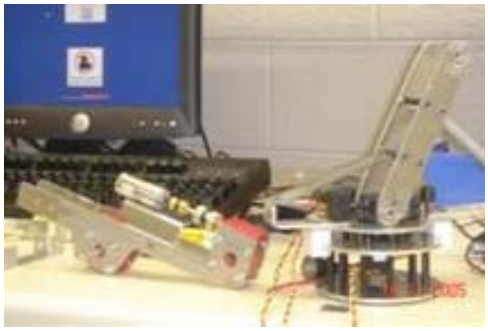
www.abosraj.com/group03/

INDUSTRIAL SPONSOR
Goddard Space Flight Center (NASA)

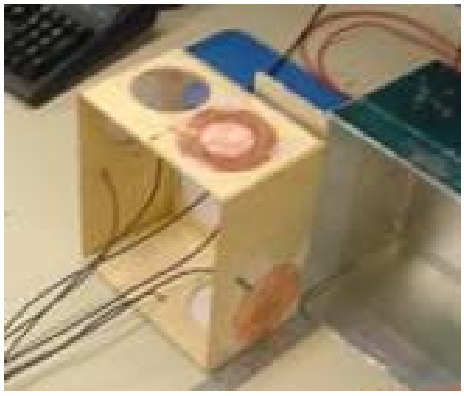
SPONSOR CONTACT
Mr. Mike Comberiate

Prof. Erik Goodman
Faculty Facilitator

REDESIGN OF ROBOT ARM AND DOCKING MANEUVER



Team 3 was assigned the task of redesigning the robotic arm previously developed by NASA & MSU. The sponsor, Goddard Space Flight Center (NASA) plans to use this arm to test technology for possible use on an unmanned mission to the Hubble Space Telescope for upgrading purposes. NASA's specifications will require six degrees of freedom for the robotic arm and tele-operation via a web interface. Capacitive sensors, known as capaciflectors and invented at Goddard Space Flight Center, will be used in our project, starting from improved capaciflector hardware developed over the summer of '05. The new design includes replacing the servomotors at the wrist and elbow joints with worm gears and DC motors. Thus, the team must also change the inverse kinematics code governing the movement of the arm. The new capaciflectors will be placed on a box attached to the end of the arm, and will guide the arm to dock the box into a larger receptacle. The ultimate goal of this project is to implement a collision-free auto-dock procedure.



Oral Presentation: 11:30am

Manager

Rashid Al-Hajri

Webmaster

Abdulrahaman Almukairin

Doc. Prep.

Joe Ciolek

Present. Prep.

Abhishek Sarma

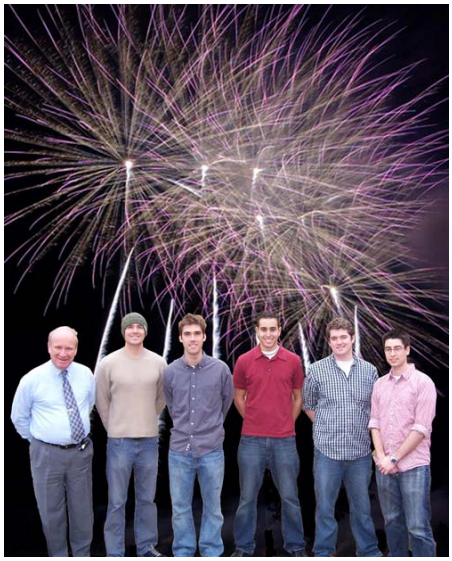
Lab Coord.

Stephan Shatara

Liaison

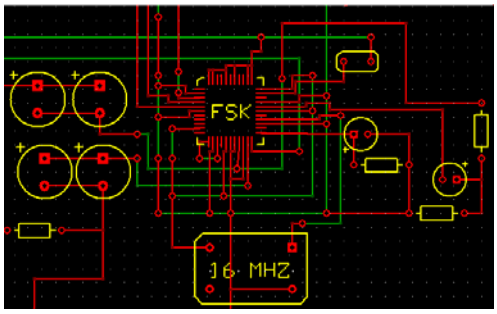
Rafat Elahi

ELECTRONIC TRIGGERING SYSTEM FOR FIREWORK SHOWS



Team 4 was given the opportunity to work with Ace Pyro, LLC, of Manchester, Michigan, to design a firework triggering system for professional firework displays. The sponsor may one day manufacture the system in order to reduce operating costs and gain a competitive edge on the market. The main objective of this design is to communicate and provide power to 256 field modules over a single pair of 22 AWG solid copper wires. The system must be able to deliver 4 amps at 24 volts for 30 milliseconds to fire commercially available electric igniters.

In order to better understand the design objectives, the team traveled to Flint, MI to observe the Ace Pyro team in action; they were preparing for their largest show of the year! The eight-wire system currently being used by the sponsor is unreliable, difficult to set up, and costly. The old system is also unable to perform simultaneous firings. After seeing the disadvantages of the current system, the team worked diligently to design a new system based on two-wire technology that would address these issues and allow for more spectacular firework shows in the future.



Oral Presentation: 11:00am

ACE PYRO, LLC

Manager

Robert Flotkoetter

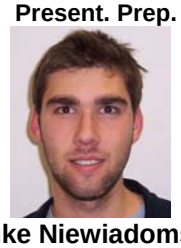
Webmaster

J. Ross Hamilton

Doc. Prep.

Ryan Fitch

Present. Prep.



Luke Niewiadomski

Lab Coord.

Steve Rukstelo

Electrical and Computer Engineering
Michigan State University

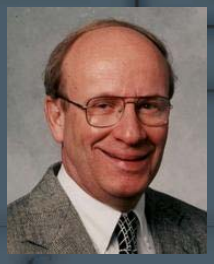
ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #04
"Electronic Triggering System for Firework Shows"

www.egr.msu.edu/classes/ece480/goodman/fall/group04/

INDUSTRIAL SPONSOR:
Ace Pyro, LLC

SPONSOR CONTACT:
Mr. Aaron Enzer



Prof. Robert Schlueter
Faculty Facilitator

ACCESSIBLE EXERCISE MACHINE DATA TRANSMITTER

Electrical and Computer Engineering
Michigan State University

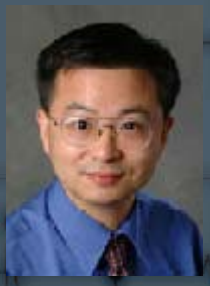
ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #05
"Accessible Exercise Machine Data Transmitter"

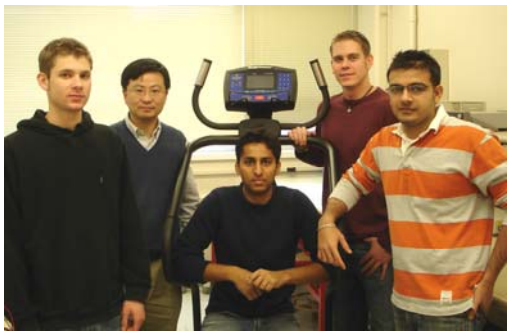
www.egr.msu.edu/classes/ece480/goodman/fall/group05/

INDUSTRIAL SPONSOR
Daimler Chrysler

SPONSOR CONTACT
Mr. Stephan Blosser
MSU Artificial Language Laboratory



Prof. Peixin Zhong
Faculty Facilitator



In an effort to provide full participation for people with disabilities, MSU's Artificial Language Laboratory has specified a project for design and construction of a system that will enable users with blindness or some other disabilities to participate more fully in an exercise program. The project is to build a wireless data transmitter that will send machine identification and information related to amount of work, speed, heart rate, calories burned, etc., from a Stairmaster 3400 bike. This data will be received by a body-worn computer (PDA) that will give auditory and vibrotactile feedback to the user. This solution will be duplicated on several different machines used in an exercise routine, each using a common standardized protocol. The wearer of the portable receiver will be able to walk from machine to machine and be given the name of the machine, instruction on its use, and performance data when he/she is using it. Our design team worked in parallel with another team that that created the receiver and PDA application software. This device can be used for many other applications, such as access to home appliances or monitoring of automobile performance. Auditory feedback might enable them to work in a complex manufacturing environment, for example. The project is financially supported through a grant from DaimlerChrysler.

Oral Presentation: 12:00pm

DAIMLERCHRYSLER

Manager

Sarfraz Maredia

Webmaster

Michael Simon

Doc. Prep.

Balaji K.Nagre

Present. Prep.

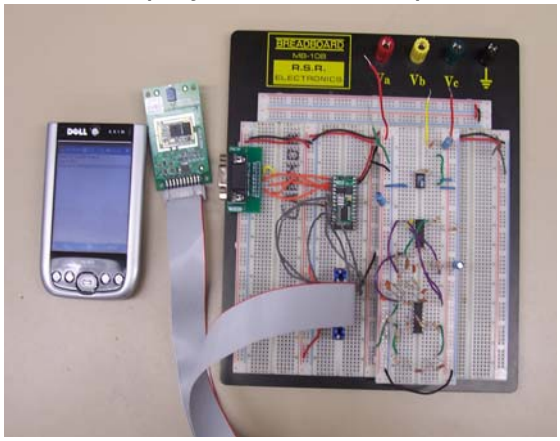
Karthik Sanagavarapu

Lab Coord.

Jeffrey Deliso

ELECTRONIC ACCESSIBLE EXERCISE MACHINE DATA RECEIVER

Team 6 was given the task of making an exercise machine accessible to the visually impaired. This was done with the help of the MSU Artificial Language Lab and a grant from Daimler Chrysler. There are three major goals outlined for this project. One is to have wireless communication between a Pocket PC and the workout machine. This was accomplished using the Bluetooth standard of communication because of its low power consumption, high speed, and built-in availability in a Pocket PC. Second, the project must provide audio feedback for each stage in the workout program. This portion of the project was created using a speech synthesis engine provided by Neospeech. The final task for this project was the implementation of a heart rate monitor that is capable of wireless communication with the main Pocket PC program. The successful completion of this project, along with the data transmitter of Team 5, could have far reaching potential in the future with helping those who suffer from visual impairments.



Oral Presentation: 2:30pm

DAIMLERCHRYSLER

Manager

J. Schraffenberger

Webmaster

M. Cannon

Doc. Prep.

J. Touroo

Present. Prep.

R. Mrozek

Lab Coord.

H. Ahmad

Electrical and Computer Engineering
Michigan State University

ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #06
"Electronic Accessible Exercise Machine Data Receiver"

ece480.mymsu.org

INDUSTRIAL SPONSOR
Daimler Chrysler & MSU Artificial Language Lab

SPONSOR CONTACT:
Stephen Blosser

Prof. Robert McGough
Faculty Facilitator

Electrical and Computer Engineering
Michigan State University

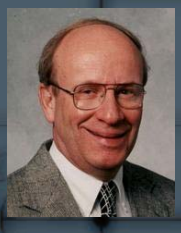
ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #07
"Built-in Power Generation for Towed, Lighted Aircraft Banner"

www.egr.msu.edu/classes/ece480/goodman/fall/group07/

INDUSTRIAL SPONSOR
Sennetech, Inc.

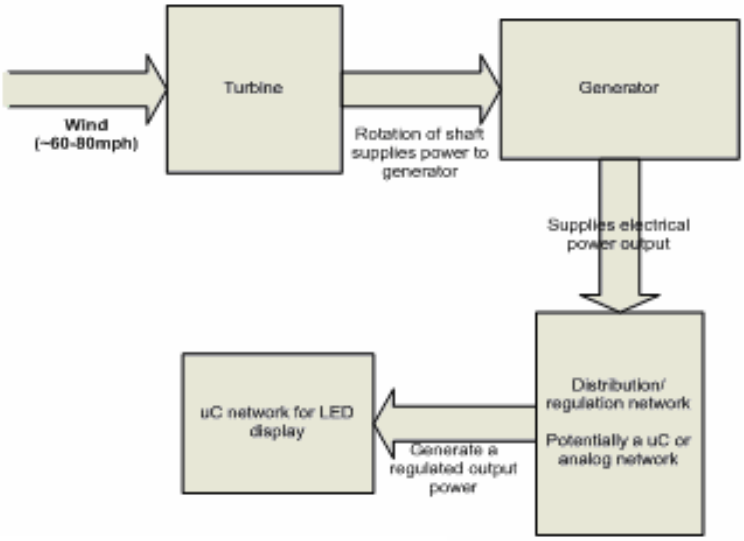
SPONSOR CONTACT
Mr. James Senneker



Prof. Robert Schlueter
Faculty Facilitator

BUILT-IN POWER GENERATION FOR TOWED, LIGHTED AIRCRAFT BANNER

The goal of this design is to provide a reliable source of power external to an aircraft. This will provide the necessary power to a modular display system that will allow an aircraft to tow an illuminated sign. The specification calls for providing two voltage sources at DC levels. The first will provide reliable power to an LED network at a voltage that will ensure correct brightness of the LED's. The second will power and operate the microcontroller with a closely regulated 5 volts. The team is designing a wind-powered generator module to supply power to the banner. This will be done by converting a DC motor into a reliable generator. Team Seven did extensive research on the theory and practice of using DC motors in this way. Using the analog circuitry that the team is now building, a very visible banner will be able to fly with a power source that is completely independent of the airplane's electrical system.



Oral Presentation: 9:30am

Sennetech

Manager

Kyle Finkbeiner

Webmaster

Phi T. Dang

Doc. Prep.

Mike Morris

Present. Prep.

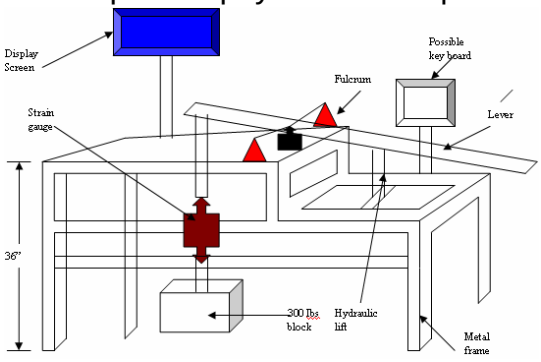
David Yang

Lab Coord.

Linda Joegiono

NEW EXHIBIT FOR SIMPLE MACHINES GALLERY

Team 8 was assigned the task of creating a new display for the Impression Five Museum (I5). The design will electronically measure the force that a user applies as a load on a lever and display this information, helping the user to realize how a lever works. To make the exhibit interesting to children, who make up most of the visitors at I5, the process of measuring and displaying the force will be made into a simple game. In this game, the user is able to guess how much force they will be able to apply at the load before applying it, receiving a congratulatory message if the guess is close to the actual value. The game is based on how far away the user's hand is from the fulcrum of the lever. The design is intended to create a fun experience for children while simultaneously teaching a fundamental aspect of physics. The sponsor has specified that the design needs to be easily maintainable as well as very safe, as it will be used by many children each day. These have remained as main concerns throughout the design process, creating a safe and entertaining experience for users.



Oral Presentation: 4:30pm

Manager

Eric Down

Webmaster

Bushiri Abdallah

Doc. Prep.

Ashwin Desouza

Present. Prep.

Bruk Tekie

Lab Coord.

Erica Wiegmann

Electrical and Computer Engineering
Michigan State University

ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #8

"New Exhibit for Simple Machines Gallery"

www.egr.msu.edu/classes/ece480/goodman/fall/group08/

INDUSTRIAL SPONSOR
Impression Five Museum

SPONSOR CONTACT:
Mr. Cyrus Miller

Prof. Jian Ren
Faculty Facilitator

A WIRELESSLY-CONTROLLED ROBOTIC FISH AS A SENSOR PLATFORM

SPIE, the International Society for Optical Engineering, has awarded the Electrical and Computer Engineering department at MSU an educational grant to develop a senior capstone design program in the area of smart materials and systems. The goal of this project is to create a robotic fish which is controlled via wireless communication. Such a platform will have potential in a wide range of civil and military applications such as environmental monitoring and control, and surveillance in hostile waters. Our robotic fish, code-named NEMO, will meet its requirements in the following ways:

- **Wireless communication using Zigbee 802.15.4 IEEE Standard**
- **GPS and digital compass for navigational purposes**
- **Temperature sensor for environmental monitoring**
- **Tail made of Electro-Active Polymer ("artificial muscle"), which eliminates the need for motors**
- **Graphical User Interface (GUI) to send/receive information through wireless network**
- **Realistic fish-like body design that withstands harsh water environments**
- **Low power consumption for long-term operation**

Oral Presentation: 3:30pm

Project Manager **Joel Jackson**

Document Prep **Xin Zhou**

Lab Coordinator **Azra Kapetanovic**

Presentation Prep **Jason Rapai**

Webmaster **Ben Sabadus**

Electrical and Computer Engineering
Michigan State University

ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #9

NEMO

"A Wirelessly-Controlled Robotic Fish as a Sensor Platform"

http://www.egr.msu.edu/classes/ece480/goodman/fall/group09/

SPONSOR

The International Society for Optical Engineering

Sponsor Contact & Faculty Facilitator

Prof. Xiaobo Tan

EQUINE WIRELESS ENDOSCOPIC VIDEO SYSTEM

Horses commonly suffer from upper airway obstructions and because these animals breathe through their noses, these obstructions need to be diagnosed and treated before horses can successfully race or perform other athletic functions. The College of Veterinary Medicine has assigned Team 10 the task of designing a wireless endoscopic video system capable of diagnosing an exercising horse. Sponsor's specifications require wireless operation within an arena with range of up to 500ft. The endoscope and video processor are mounted on the horse and powered by a rechargeable battery. Wireless video transmission is sent to a remote laptop PC where the video is displayed on a graphical user interface (GUI). Wireless articulating movement of the endoscopic tube is controlled from the GUI. The current state-of-the-art diagnostic method for evaluating upper airway dysfunction in exercising horses is video-endoscopy of the upper airway while horses run on a treadmill. The team's mission is to provide the most accurate diagnosis possible by allowing the horse to run freely while presenting the user with a fundamentally friendly mode of operation.

Current Methodology

Oral Presentation: 1:30pm

College of VETERINARY MEDICINE
Michigan State University

Manager

Robert Lyons

Webmaster

Edward Bradford

Doc. Prep.

Brian Pecsek

Present. Prep.

Nathan Crawford

Lab Coord.

Timothy Soedarjatno

Electrical and Computer Engineering
Michigan State University

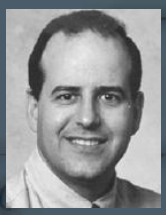
ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #10
"Equine Wireless Endoscopic Video System"

www.ewevs.org

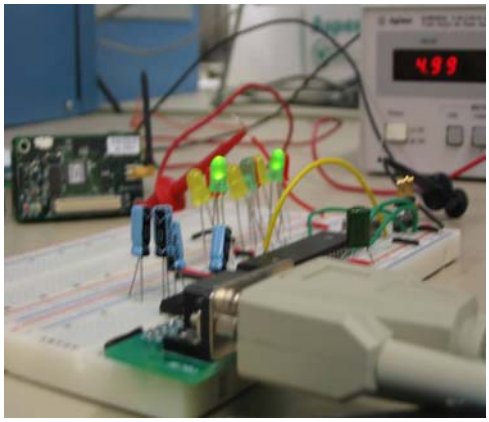
SPONSOR
MSU College of Veterinary Medicine

SPONSOR CONTACT:
Dr. Frederik Derksen

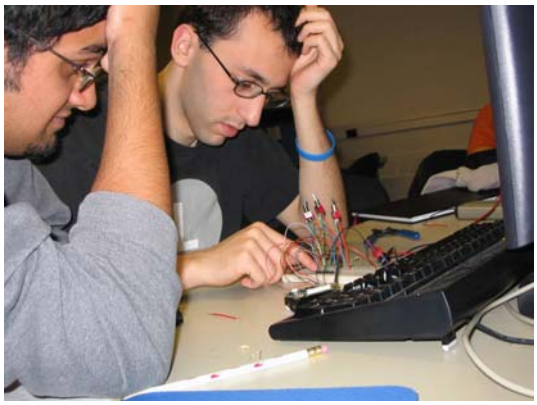


Prof. Fathi Salem
Faculty Facilitator

“SAFE–WARN” SYSTEM USING ZIGBEE WIRELESS NETWORK PROTOCOL



Team 11 was given the task of designing and establishing a “Safe–Warn” wireless network using Zigbee wireless technology developed from the IEEE 802.15.4 standard. This wireless network will be a tool to assist drivers in identifying hazardous events and emergencies before actually reaching them. A practical application of this would be to notify drivers ahead of time if a car pile-up was detected, so that they may have ample time to take necessary precautions. With the support of the Lear Corporation, different scenarios and network configurations were established and then implemented. Using CrossBow Zigbee transceivers, otherwise known as motes, we were able to write code to implement our network through the programming language, nesC, as well as run the motes through the TinyOS operating system. The result is a wireless warning system that establishes two different networks based on three different emergency events.



Oral Presentation: 9:00am

Electrical and Computer Engineering
Michigan State University

ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #11
“Safe-Warn System”

www.egr.msu.edu/classes/ece480/goodman/fall/group11/

INDUSTRIAL SPONSOR
Lear Corporation

SPONSOR CONTACTS
Mr. John Nathan
Mr. Winston Maue

Prof. Subir Biswas
Faculty Facilitator

Manager

Ian Liskiewicz

Webmaster

Paul Karatsinides

Doc. Prep.

Amit Patel

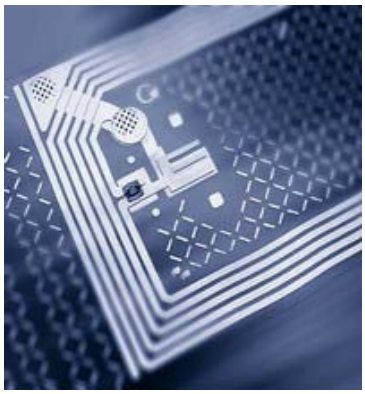
Present. Prep.

Jonathon Ratliff

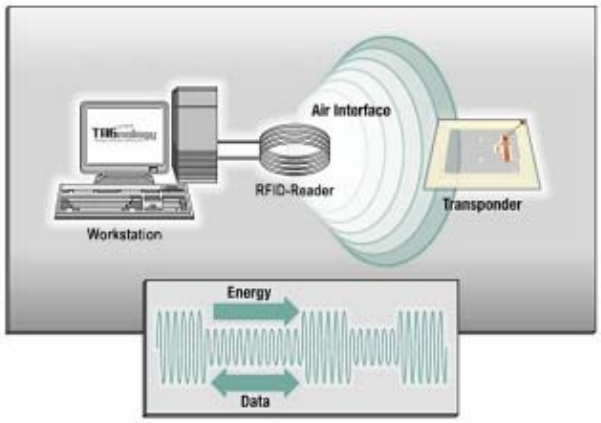
Lab Coord.

Steven Gregor

PASSIVE RFID
SEAT BELT LATCH DETECTOR



Team 12 was assigned to investigate and research applications of Radio Frequency Identification (RFID) technology to today's most basic feature in the automobile: the seatbelt. By utilizing this technology we can improve the monitoring of the seatbelts as opposed to the current mechanical shorting bar method. RFID technology is currently used throughout the retail and shipping industry, and applying this technology to an automobile will allow not only an inexpensive solution to seat belt monitoring, but also a gateway for monitoring other conditions in the vehicle, such as presence and occupancy of the seat. RFID contains 4 components: a computer system, a reader, an antenna, and a transponder (tag). By inserting the tag into the seatbelt, we can then wirelessly monitor whether or not the seatbelt is buckled, using the computer system and reader. Tags are powered wirelessly from the signal captured by the antenna, which makes it easier to design seats that can be removed and installed without the user having to deal with wires. The reader has the ability to detect multiple tags at once, which is ideal for monitoring multiple conditions at once.



Oral Presentation: 10:00am

LEAR CORPORATION

Manager

Conrad Hunt

Lab Coordinator

Rahim Maknojia

Webmaster

Byung-Joon Jin

Present. Prep

Mark Namy

Document Prep.

Niki Doshi

ECE

Electrical and Computer Engineering
Michigan State University

ECE 480 SENIOR CAPSTONE DESIGN

DESIGN TEAM #12
"Passive RFID Seat Belt Latch Detector"

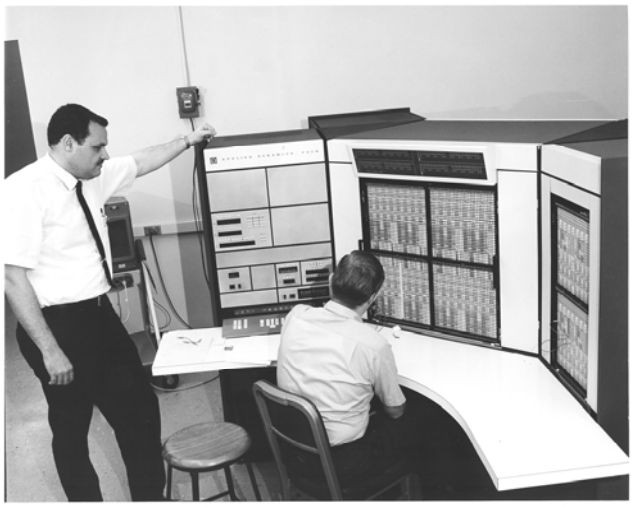
www.egr.msu.edu/classes/ece480/goodman/fall/group12/

INDUSTRIAL SPONSOR
Lear Corp.

SPONSOR CONTACTS:
Mr. John Nathan
Mr. Winston Maue

Prof. Fang Peng
Faculty Facilitator

The Good Old Days in EE at MSU

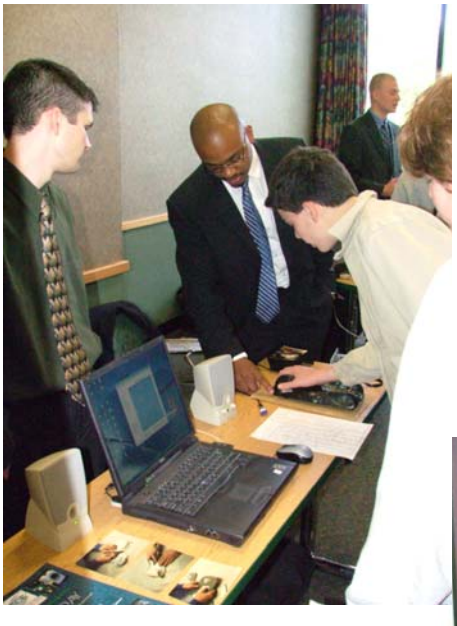


Prof. George Coulman [left], Chemical Engineering, was pushing sense switches on the IBM 1800 computer in the College of Engineering, in the late '60's. The IBM 1800 and the AD4 analog computer shown on right constituted a state-of-the-art **hybrid** computer that provided the fastest way to solve sets of differential equations at that time. Prof. Erik Goodman, who now teaches ECE Capstone Design, used that 1800 computer in 1971 to run a genetic algorithm to optimize 40 parameters of a model of a bacterial cell. One run took about a year of computing – the 1800 accessed a 16-bit word in 3.6 microseconds.

The first computer at MSU, MISTIC, was built by EE faculty members in the Electrical Engineering Building (now the Computer Center), shown at left.

Where are the digital instruments and computers in these labs (above, left)? In the '40's, they didn't exist! But teams of MSC students, using analog oscilloscopes and slide rules, were busy solving design problems, nonetheless!

Above: A happy Ryan Gorski shows off his Team 10's wireless automotive sensor system – it's working!



Left: Chordic keyboard is exercised under the guidance of teammates Freddie Kirkland and Thomas Brogan

Below: NASA Goddard-sponsored robot is put through its paces during Design Team 3's talk

Candid Shots from ECE Design Day April 28, 2005

Above: Team 4, sponsored by Robert Bosch Co., shows off its radio-frequency comb generator

Middle school students learned about electrical and computer engineering at ECE Design Day, too! On right, Matt Mets discusses Team 2's project with a student from Kinawha Middle School, Okemos, MI.

THANKS TO OUR SUPPORTERS!

ECE 480, Senior Capstone Design, is made possible by funding from many sources – tuition and student fees pay only a part of the cost.

Thanks, Industrial Sponsors!

Each team's industry sponsor helps cover the cost of the team. In addition, we are particularly grateful to the company engineers who help to define the problems, answer our students' questions, and provide them feedback on their progress.

ECE Design Day Sponsor

Prism VenturePartners

Generous support from Mr. Bill Seifert and the company in which he is a General Partner, Prism Venture Partners, funds not only the cash prizes, but also many of the other costs of ECE Design Day. This support has made it possible to make ECE Design Day a public event, highlighting our students and their work to the community.

DaimlerChrysler Grants Fund Projects for Persons with Disabilities

Grants from DaimlerChrysler have allowed two teams each semester in academic years 2004-2005 and 2005-2006 to address problems relating to persons with disabilities, even though the teams do not have a paying company sponsor. These projects are defined with the help of MSU's Resource Center for Persons with Disabilities and its Artificial Language Laboratory. Mr. Stephen Blosser has served as the customer liaison for these projects. Fall, 2004, projects included the talking dryer and the talking boating/fishing sensor system. Spring, 2005, featured the Machine Control Panel Evaluation Tool project, which will help provide web accessibility for appliance control and help assess the usability of appliance control panels, and the Chordic Keyboard project, which designed and built a new, specialized chordic keyboard that allows a person in the community with cerebral palsy to use his computer to produce speech for him. Fall, 2005 includes the projects by Teams Five and Six aimed at making exercise machinery more accessible to persons with disabilities.

DAIMLERCHRYSLER

Thanks, Judges!

The Department of Electrical and Computer Engineering thanks our judges for spring, 2005: Lt. Col. Kenneth Bow (US Army, retired), Mr. Greg Hoshal (Instrumented Sensor Technology), and Mr. Jim Senneker (Sennetech).

Companies! Want to sponsor a team?

Each fall and spring, ECE 480 teams need projects to work on – why not make one of them yours? Be a "customer" for our students. It gives you a great chance to look over five graduating seniors, and a chance to pursue "that idea you haven't had a chance to assign someone to." To discuss, please email or call Erik Goodman, goodman@egr.msu.edu, (517)355-6453. We need to know of your interest at least a month before the semester starts (July for fall and early December for spring semester). The cost is minimal, and the time commitment by your company is small. Think about it!

PRISM VENTURE PARTNERS PRIZE WINNERS, SPRING 2005

The Prism Venture Partners Prizes ($1,500, $1,000, and $500, respectively) are awarded each semester to the most outstanding teams in the Electrical and Computer Engineering Senior Capstone Design Course, as judged by a panel of engineers from industry. You can see videos of all teams' final oral presentations at http://www.egr.msu.edu/classes/ece480/goodman/finalpresentations/

First place: Team # 4, "Radio Frequency Comb Generator," sponsored by Robert Bosch Corporation. LEFT TO RIGHT: Steve Erskine, Marie Piasecki, Jenifer Johnson, Elissa Carey, and Matt Castel, with Professor Erik Goodman. A comb generator is designed to produce signals of the same amplitude at many frequencies, for use in calibrating a test chamber.

Second Place: Team #10, "Low-Power Wireless Automotive Sensor Network," sponsored by MSU's Wireless Automotive Sensors Lab. LEFT TO RIGHT: Christopher Boylan, Adam Borchert, Matt Mets, Kevin Boice, and Ryan Gorski.

Third Place (three-way tie): Team #7, "Machine Control Panel Evaluation Tool," a project to assist in adapting appliance controls for use by persons with disabilities and to test the effectiveness of the controls. Team was sponsored MSU's Artificial Language Laboratory, supported by a grant from DaimlerChrysler. LEFT TO RIGHT: J. Arnold, Y. Kwun, S. Ziel, R. Lewandowski, K. Siddiqui, with Professor Goodman.

Third Place: Team #6, "Chordic Keyboard," sponsored by MSU's Artificial Language Laboratory, supported by a grant from DaimlerChrysler. LEFT TO RIGHT: Jacob Maes, Freddie Kirkland, Abdulhadi Al-Hajiri, Thomas Brogan, and Ashley Hall, with Professor Goodman. This keyboard is for people with cerebral palsy to use in speech synthesis. It's like keyboards used by court reporters, who press several keys at once (a "chord") for each entry – but get the equivalent of several letters of typing. This implementation allows tuning of input forces.

Third Place: Team #3, "Obstacle Avoidance on Simulated Lunar Terrain Using Depth Images," sponsored by NASA Goddard Space Flight Center. LEFT TO RIGHT: Eric Rader, Matt Julien, Mark Belz, and Justin McCoy, with Professor Goodman.

SPARTY Meets His Mini-Me as Capstone Design Team Prepares its Robot For Breslin Center!

Photo: Garth Motschenbacher

Left-to-right: Jacob Kuiper, Dean Satish Udpa, Sparty robot, Sparty, and Erich Hauptli, Homecoming, 2005. The students were two of the five who built the robot.

One of the Senior Capstone Design teams in Electrical and Computer Engineering built a robot for MSU's Department of Intercollegiate Athletics last spring. The robot is still under construction and being refined for more advanced capabilities. A wireless videocamera system in the robot's helmet will allow it to take video of the crowd at a basketball game, for example, and have it displayed on the big scoreboard above the middle of the court. The robot is designed to look like the Spartan statue that comes bursting out of the screen in the pre-game video, rather than like the familiar green-and-white Sparty mascot, but it was still great fun on October 22, 2005, when the "real" Sparty came to the College of Engineering Homecoming Tent and "dueled" with the robot. Sparty didn't seem too afraid of the mechanical contraption, and it was fun to watch them lunging at each other!