Real Projects. Real Sponsors. Real Learning.

College of Science and Engineering

UNDERGRADUATE
PROJECTS DAY
JUNE 2, 2006

GRADUATE PROGRAM
PROJECTS NIGHT
JUNE 8, 2006

WELCOME FROM THE DEAN

It gives me great pleasure to welcome you to Projects Day 2006. This is the nineteenth year of the Science and Engineering Project Center, and I would like to congratulate everyone both within the college and outside for making the Project Center the success it is today. Your dedication, skill, and hard work are greatly appreciated.

We present to you the results of our students' endeavors, which have been sponsored by industry, government, and other agencies, and developed by students in the science and engineering program at Seattle University. Our students are very excited at this opportunity to share the results of their hard work with you.

This capstone experience is perhaps the most important learning experience for our students and is the culmination of their studies at Seattle University. Working in teams of four or five, they have to solve open-ended problems that may not have a unique solution while adhering to strict timelines, budgets, and the needs of outside agencies. This is an excellent preparation for the professional positions our students will fill upon graduation.

We are most grateful to our corporate sponsors, those who are veterans at sponsoring our projects and those who are new this year. It is a tribute to your faith in our students, and in the quality of their work, that you choose to invest your time and resources in these projects. Thank you.

Finally, a big thank you to everyone whose hard work has brought these challenging projects to fruition. Our faculty, students, and professional mentors have worked together for this past year to achieve the results you will see here today. Congratulations!

George Simmons, Dean
College of Science and Engineering

WELCOME FROM THE PROJECT CENTER DIRECTOR

I also extend to you, on behalf of our faculty and students, a warm welcome to Projects Day 2006, our annual presentation of design team results to sponsoring organizations, visitors, and friends. I am grateful for the encouragement and assistance provided by our Science and Engineering Advisory Board and the Project Center Advisory Committee in promoting the external sponsorship of our projects.

This printed program includes both undergraduate and graduate projects. The undergraduate projects will be presented the morning of Friday, June 2, in Sullivan Hall (School of Law). The Master of Software Engineering projects will be presented the evening of Thursday, June 8, in Wyckoff Auditorioum in the Bannan Center for Science and Engineering.

I would also like to acknowledge the coordination efforts of professors Nirmala Gnanapragasam in Civil and Environmental Engineering; Alvin Moser in Electrical and Computer Engineering; Teodora Rutar Shuman in Mechanical Engineering; and William Poole in Computer Science and Software Engineering, as well as Sheridan Botts, contracts manager, and Michael Mabie and Michael Smith, administrative assistants.

Your hosts for Projects Day are students from our engineering organizations, and special thanks go to them for the time and energy they put into the tasks associated with our Projects Day celebration. Student societies represented are: American Society of Civil Engineers (ASCE), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), National Society of Black Engineers (NSBE), Society of Environmental Engineers and Scientists (SEES), Society of Women Engineers (SWE), and Tau Beta Pi. I also want to thank Dean Kellye Testy and Associate Dean Richard Bird of the School of Law for all their help with this year's presentation in their facility.

This is truly a day that can only happen when Seattle University and the larger community work together to support the scientists and engineers of tomorrow.

Jeff Gilles, Director
Science and Engineering Project Center

Undergraduate Projects Day
Seattle University Sullivan Hall
June 2, 2006

9:00 a.m.
Projects Day Registration and Project Displays

9:30 a.m.
Welcome, President Stephen Sundborg, S.J. and
Dean George Simmons

9:40 a.m
Concurrent Sessions

CEE Teams

Coughlin Porter Lundeen, Inc.	Storm Water Analysis and Impact
HDR Engineering, Inc.	Reconstruction Project
NOAA and Appia Engineering	Evaluation of Building 8

ME Teams

The Boeing Company	Out-of-Plane Tensile Strength Test
The Boeing Company	Aircraft Escape Slide Loading Tool
The Boeing Company	Trash Management/Recycling Cart
Industrial Revolution	Candle Lantern Redesign

ECE Teams

The Boeing Company	Galley Power Management
The Boeing Company	Power Line Communication
Honeywell, Inc.	Power Factor Correction

CSSE/ECE Teams

AREVA T&D	Serial Communication Testing
The Boeing Company	Digital Signal Processor
Adobe Systems, Inc.	Photo Frame Widget

10:50 a.m
Break

11:00 a.m.
Concurrent Sessions

CEE Teams

Octaform Systems, Inc.	Effect of PVC Formwork on Concrete
Seattle Public Utilities	Integrated Drainage Plan
Tetra Tech/KCM, Inc.	Clear Creek Floodplain Mapping

SCHEDULE

ME Teams

Kenworth Truck Company
Kenworth/PACCAR
Seattle Lighthouse for the Blind

Cab Extender
Insulation Analysis Methods
Dynamic Braille Display

ECE Teams

PACCAR
Philips Ultrasound
Seattle City Light

Advanced Truck Network Connections
GPU-Based Image Processing
Network Restoration

CSSE Teams

Intelligent Results
Noetix
Nordstrom

Improving Predictions
Excel Plug-In
Package Tracker

12:00 p.m. Buffet Lunch

Master of Software Engineering Projects Night
Bannan Center for Science and Engineering, Wyckoff Auditorium
June 8, 2006

6:00 pm
Social Hour

6:20 pm
Welcome, Dr. William Poole

6:30 pm
Team Presentations

The Boeing Company
Cisco Systems, Inc.
Semantium Corp.
Washington Mutual

Linux Cluster GUI
TUI Test Automation
Agile Project Management Tool
VOCALS Project

7:50 pm
Coffee and Snack Break

8:00 pm
John Vu, The Boeing Company, Information Technology and Global Capability

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CIVIL AND ENVIRONMENTAL ENGINEERING

TITLE: Stormwater Analysis and Impact: Stormwater Regulations and
                     Land Development
NUMBER: CEE 06.1
SPONSOR: Coughlin Porter Lundeen, Inc.
SPONSOR LIAISON: Keith Kruger
FACULTY ADVISOR: Prof. Phillip Thompson
STUDENTS: Anna Dumo, Curtis Jasper, Michele Pfeilschiefter, Ryan Reynolds

Stormwater detention and treatment are integral to site development. Over the past 40 years, changes in state and local stormwater regulations have led to design modifications for storage and treatment systems. In some cases, this has led to increased costs and land use. Coughlin-Porter-Lundeen, Inc. wanted to know how these historic regulatory changes have affected the cost of stormwater treatment systems and asked for a hydrologic analysis of the Woodridge Elementary School redevelopment project in Bellevue. The design team analyzed the site hydrology by using four commonly used modeling techniques: the Y&W method, Santa Barbara Urban Hydrograph, KCRTS, and WWHM2. The model results were used to design a stormwater detention and treatment system that meets current regulatory standards. Different stormwater systems for the site were also designed to meet past regulatory requirements. Model results indicated that stormwater treatment costs have significantly increased as the regulatory standards have changed.

TITLE: Somerset Community Recreation Club Reconstruction
NUMBER: CEE 06.2
SPONSOR: HDR Engineering, Inc.
SPONSOR LIASONS: Samir Rustagi, Dr. Michael Norton, Dr. Wade Hathorn
FACULTY ADVISOR: Prof. Nirmala Gnanapragasam
STUDENTS: David Gibbs, Amanda Harris, Leta Thomas

The Somerset Community Recreation Club is a summer-only community recreation facility located in the Somerset neighborhood of Bellevue. The pool and clubhouse were completed in the late 1960s and have served as a community focal point ever since. Somerset Community Recreation Club has spectacular views of Lake Washington and downtown Seattle, but the aging facility is in need of an update. HDR Engineering requested that the team do a site redesign and fulfill all needed requirements to apply for a conditional use permit from the City of Bellevue. The team designed a new clubhouse and an enlarged and enclosed pool, performed storm water and slope stability analyses for the site, and completed a preliminary permitting package. The new design retains the unique beauty of the site, adds new facilities to the club, and allows for the club and pool to be open year-round.

TITLE: NOAA Western Regional Center Building 8 Expansion
NUMBER: CEE 06.3
SPONSORS: NOAA and Appia Engineering Consultants
SPONSOR LIASONS: Rino Balatbat (NOAA), Nick Paranjpye (Appia)
FACULTY ADVISOR: Prof. Jeff Dragovich
STUDENTS: Enrique Castegnaro, Andrew Dyrsten, Andrew Koehn,
                     Chad McDonald

The National Oceanic and Atmospheric Administration (NOAA) monitors global climate and atmospheric conditions for the United States Government. In order to accommodate the increased demand for their work, NOAA seeks to expand the offices and workshops of the Field Operations Division in Building 8 at the Western Regional Center in Seattle. The design team provided a 90% design development of the expansion that will be used for requests for qualifications and proposals as well as project pricing. The expansion design developed by the design team will increase the current space of the offices and shops by 7500 square feet. The expansion also addressed the need for seismic isolation between the new and old structures by incorporating a seismic joint between the two structures.

Title:	Effect of PVC Stay-In-Place Formwork on the Mechanical Performance of Concrete
Number:	CEE 06.4
Sponsor:	Octaform Systems Inc.
Sponsor Liaison:	Rishi Gupta
Faculty Advisor:	Prof. Katherine Kuder
Students:	Corinne Harris-Jones, Richard Hawksworth, Sean Henderson, Jason Whitney

Octaform components are used as stay-in-place formwork for concrete. Octaform asked the team to test their polyvinyl chloride (PVC) forming technology. By designing and performing flexure and compression tests on both Octaform-encased concrete and concrete without encasement, the effect of the PVC on the mechanical properties of concrete was evaluated. Flexure tests were conducted on reinforced and unreinforced specimens. In addition, temperature was monitored using embedded thermocouples to evaluate the influence of the PVC encasement on the heat of hydration and, consequently, overall strength development. The team reported the results of their testing to Octaform.

Title:	Seattle Housing Authority and Sound Transit Integrated Drainage Plan Off-site Stormwater Treatment Alternative
Number:	CEE 06.5
Sponsor:	Seattle Public Utilities
Sponsor Liaison:	Shelly Basketfield, Ingrid Wertz
Faculty Advisor:	Prof. Jean Jacoby
Students:	Sarah Brundidge, Lisa Knapp, Mark Morrow

Seattle Public Utilities (SPU) approved the use of an Integrated Drainage Plan (IDP) to provide off-site stormwater treatment for the Seattle Housing Authority redevelopments of Holly Park and Rainier Vista and the Sound Transit transportation corridor on Martin Luther King Way. An Integrated Drainage Plan allows stormwater treatment for multiple projects to be provided at an off-site location within the same drainage basin. Rainier Beach High School was selected as the off-site stormwater treatment facility location. Seattle Public Utilities asked the design team to provide an analysis of two stormwater treatment strategies. One strategy would be located in the the high school parking lot and would treat off-site stormwater from an 84-in stormline adjacent to the site. The second strategy would use porous pavement to treat the high school on-site runoff. The team evaluated alternative systems for the off-site treatment strategy, as well as different porous pavement materials for the on-site treatment strategy. The preferred stormwater treatment strategy was determined and the team made a final recommendation to Seattle Public Utilities based on water quality objectives, best management practices and a benefit/cost analysis.

CIVIL AND ENVIRONMENTAL ENGINEERING

TITLE:	Clear Creek Floodplain Mapping
NUMBER:	CEE 06.6
SPONSOR:	TetraTech/KCM, Inc.
SPONSOR LIAISONS:	Tony Melone, Tom Spangenberg
FACULTY ADVISOR:	Prof. Mark Siegenthaler
STUDENTS:	Omar Almuhairi, Todd Kortus, Alex Pizarro, Kyle Potuzak

TetraTech/KCM, Inc. specializes in water resources, surface water management, fisheries, and public works facilities. Through FEMA's Map Modernization Program, TetraTech/KCM is updating the Flood Insurance Rate Maps and asked the team to develop maps for part of Clear Creek in Kitsap County, Washington. The team utilized HEC-HMS, HEC-RAS and Geo-RAS, and ArcMap GIS as hydrologic, hydraulic, and mapping tools. Peak discharge values were computed for 10-, 50-, 100-, and 500-year 24-hr duration flood events in HEC-HMS by updating land use and precipitation data. Flood profiles were determined for each recurrence interval using HEC-RAS. Aerial LiDAR and surveyed data points were compiled in the Geo-RAS extension of ArcMap GIS to develop both the HEC-RAS model and delineate the floodplain boundaries based on the flood profiles. Floodplain maps were produced outlining the 100- and 500-year flood hazard areas. By integrating GIS, hydrologic and hydraulic tools to perform the analysis, the team used state-of-the-art FEMA modeling/mapping methods to develop Digital Flood Insurance Rate Maps.

MECHANICAL ENGINEERING

TITLE:	Test Method Improvement for Out-of-Plane Tensile Strength in Composites
PROJECT NUMBER:	ME 6.1
SPONSOR:	The Boeing Company
SPONSOR LIAISON:	John Pryor
FACULTY ADVISOR:	Prof. Frank Shih
STUDENTS:	Andrew Enke, James Lee, Jono Nicoln, Pamela Pang

The Boeing Company is a leader in applying the latest composite technology to commercial airplanes. Boeing asked the team to improve the existing method of testing out-of-plane interlaminar tensile strength in composites. The team mathematically verified and made minor corrections to the existing ASTM D6415 testing standard. To improve the accuracy and the consistency in the current testing procedure, the team completed analysis and experiments by examining specimens with varied geometries and loading conditions. The team also optimized and manufactured the angled composite specimens and test fixture needed for the experimental study. The team wrote a test procedure for the improved test.

TITLE:	Emergency Evacuation Slide Loading Tool
NUMBER:	ME 06.2
SPONSOR:	The Boeing Company
SPONSOR LIAISON:	Rodney Burgin
FACULTY ADVISOR:	Prof. Bob Cornwell
STUDENTS:	Yoyono Buritan, Abraham Romo, Aaron Serabia, Pei-Fen Tsai

The Boeing Company plans to significantly reduce the time to install the interior components of the 787 Dreamliner compared to the time required for 777 aircraft installations. This time reduction will yield lower production costs by enhancing production efficiency. An emergency evacuation slide is located on each of the eight main cabin doors. The current method for installing emergency evacuation slides requires three assembly mechanics and significantly more than five minutes for each slide. The goal of the project is to develop a tool and process that will allow one assembly mechanic to install each of the eight emergency evacuation slides in five minutes or less. The team conducted research, design, and testing to meet the design requirements. To allow the tool to be used in the 787 interiors assembly process, it was designed to be durable, lightweight, inexpensive, and easy to use and maintain. The new tool will allow Boeing to achieve the assembly goal of five minutes per slide with a single assembly mechanic.

TITLE:	Boeing 787 Trash Management/Recycling Cart
NUMBER:	ME 06.3
SPONSOR:	The Boeing Company
SPONSOR LIAISON:	James Schalla
FACULTY ADVISOR:	Prof. Mike Larson
STUDENTS:	Fareez Ismail, Russ LeBlanc, Ellisa Lim, Kent Tjandra

The Boeing Company pays close attention to airline industry needs. The growing problem of trash management during flights is an opportunity for Boeing to create significant savings for their customers. The goal of the project was to efficiently utilize the volume available in the trash cart for trash storage. In order to accomplish this goal, the team had to determine the best means to compact each type of trash (plastic cups, soiled paper, etc) efficiently, eliminate any unused space in the trash cart, and also minimize the volume occupied by the compacting mechanism. The team designed an in-flight trash management device that improves storage capacity, is lighter, and occupies the same volume as the current device. The volume of trash collected is further reduced by separating and stacking plastic cups to be recycled. The scissor compacting mechanism employed occupies less volume. Lastly, the design fully utilizes the volume available for efficient trash storage. The new design compacts more, weighs less, and fits in the same space resulting in significant savings for airlines buying Boeing airplanes.

MECHANICAL ENGINEERING

TITLE:	Candle Lantern Redesign
NUMBER:	ME 06.4
SPONSOR:	Industrial Revolution
SPONSOR LIAISON:	Keith Jackson
FACULTY ADVISOR:	Prof. Mike Larson
STUDENTS:	Paul Goto, James Gregoire, Brian Lawson, Huy Tran

Industrial Revolution manufactures and distributes products for outdoor enthusiasts. The company currently manufactures a family of candle lanterns that are popular with campers and hikers. Industrial Revolution asked the team to design a folding candle lantern to add to their existing line of products. This new design also needed to be ready to be manufactured, meaning all materials, packaging, and cost analysis of assembly needed to be completed. After evaluating many concepts, a design with closed dimensions of approximately 1 x 3.5 x 2.25 inches was chosen that would carry at least one tea light candle when folded. Detailed engineering drawings and solid models were created based on the final lantern design. After strength and thermal analysis were completed on design materials a prototype was constructed for manufacturing review using the most effective materials tested.

TITLE:	Passive Cab Extender
NUMBER:	ME 06.5
SPONSOR:	Kenworth Truck Company
SPONSOR LIAISON:	Alec Wong
FALCUTY ADVISOR:	Prof. Teodora Rutar Shuman
STUDENTS:	Rhett Hadman, Richard Janecke, Allen Leng, Daniel Strickland

For this project, Kenworth seeks to increase fuel efficiency by reducing aerodynamic drag caused by the gap between truck and trailer on medium duty commercial trucks. Experiments show that more than 50% of total fuel consumption of commercial trucks traveling at 60 mph is due to aerodynamic drag. The team designed a passive cab extender to enclose the top and sides of the truck-trailer gap. This cab extender can be deployed at all times without interfering with vehicle's maneuverability. This is achieved through a linkage system designed for continuous passive length adjustment to accommodate for trailer movement through typical driving conditions. The cab extender can be produced economically, resulting in a return on investment within the first year of operation.

MECHANICAL ENGINEERING

TITLE:	Sleeper Insulation Analysis Methods
NUMBER:	ME 06.6
SPONSOR:	Kenworth/PACCAR
SPONSOR LIAISON:	Lew Plummer
FACULTY ADVISOR:	Prof. Christopher Stipe
STUDENTS:	Ahmad Al-Ghanim, Abdullah Al Marzouq, Kathleen Arrigotti, Jack Burgess, Michael Clancy

PACCAR, the third largest truck manufacturer in the world, is currently working to improve the insulation effectiveness of the sleeper section of their truck cabs. They are interested in using new materials and material combinations and orientations for the insulation inside the walls of the sleeper, as well as a clear coating above the paint that rejects UV/IR radiation from the sun. They asked the team to develop a tool to compare the new designs. This tool includes three components: a numeric heat transfer model, an experimental apparatus, and a cost analysis matrix. The team used solid modeling and finite element analysis to build the numeric heat transfer model. The team also constructed a hot box apparatus to verify the accuracy of the numeric model by measuring the thermal insulation properties of the materials and material combinations under consideration. The team developed a cost analysis matrix to compare possible future designs based on the total cost, including component purchase price and installation cost. Finally, the team provided PACCAR with a recommendation for the optimal insulation material combination.

TITLE:	Dynamic Braille Display
NUMBER:	ME 06.7
SPONSOR:	The Seattle Lighthouse for the Blind
SPONSOR LIAISONS:	Doug Case, Ken Wolford
FACULTY ADVISOR:	Prof. Greg Mason
STUDENTS:	Justin Hughes, Rick Oishi, John Pamonag, David Zegers

The Seattle Lighthouse for the Blind is a non-profit organization that provides training and employment for persons who are blind, and blind with other disabilities. The Seattle Lighthouse for the Blind manufactures a variety of products for customers such as The Boeing Company, and the United States Government. Currently machine operators interact with their equipment using a talking voice box. This has been successful for the blind, but a new solution was needed for use by the deaf-blind. The team developed modifications to a commercially available printing calculator that resulted in an inexpensive Braille display. The alterations include converting the calculator to Braille output, moving the motor and drive gear, removing the paper feed and printing components, designing a new plastic case for the device, and adding a custom circuit board for hardware control. Electronic hardware and software was developed for the device.

ELECTRICAL AND COMPUTER ENGINEERING

TITLE:	Serial Communication Testing: Error Simulation
NUMBER:	ECE 06.1 (in conjunction with CSSE 06.1)
SPONSOR:	AREVA T&D
SPONSOR LIAISON:	David Allen, Kevin Cheung
FACULTY ADVISORS:	Prof. Robert Heeren, Prof. David Joslin
ECE STUDENTS:	Craig Lay, Grace Chen, Mohammed Al Sheraifi
CSSE STUDENTS:	Travis Haberman, Joseph Thompson

The AREVA T&D Company is a major supplier of data collection and control software used by the power industry to monitor and regulate the function of electrical substations. This software platform, known as Supervisory Control and Data Acquisition (SCADA) gathers data collected by remote terminal units (RTU) via low speed serial communication lines. Errors that arise naturally on these communication lines are currently impossible to simulate in a lab setting. To facilitate the testing of the SCADA software's error recovery functionality our team designed an error injecting device to recreate these errors in a controlled fashion. This device takes the form of a field programmable gate array (FPGA) running an embedded microprocessor, custom VHDL scripts, and a C program. The user interface is a Windows application programmed using C#.net. It monitors the data stream and makes it possible for the user to program errors which test the function of the SCADA software.

TITLE:	Aircraft Galley Power Management
NUMBER:	ECE 06.2
SPONSOR:	The Boeing Company
SPONSOR LIAISON:	Jon Dhondt
FACULTY ADVISOR:	Prof. Dat Tran, SJ
STUDENTS:	Jecelin Centeio, Todd Moser, Sandy Halim, Tommy Wong

Boeing is currently designing the 787 aircraft and future models emphasizing fuel-efficiency. In order to achieve higher fuel-efficiency, Boeing is scrutinizing the weight of electrical wires handling distribution of power to the galleys. In response to Boeing's request, the team designed a prototype Master Galley Control Unit to control the amount of power that can be consumed at any given time. With the Master Galley Control Unit, a smaller gauge of wiring can be used, thus eliminating excess weight. The primary function of the Master Galley Control Unit is to monitor and communicate with a network of Galley Inserts so that power overloading never occurs. A fault tolerant system design allows for maximum functionality and safe operation in the event of partial or complete bus communication loss.

TITLE:	Digital Signal Processor for Lab Data Analysis
NUMBER:	ECE 06.3
SPONSOR:	The Boeing Company
SPONSOR LIAISON:	Thomas Moore, Amanda Quan
FACULTY ADVISOR:	Prof. Paul Neudorfer
STUDENTS:	John Dinning, Bryson Higa, Francis Huelar, Cedric Lescop, Adi Tedjasukmana

The Boeing Electrical Systems Laboratory performs tests to ensure that clean and stable power is supplied to the Boeing 787 Dreamliner. The lab recently upgraded its data acquisition systems and is now capable of digitizing a greater number of analog signals at a higher sampling rate, resulting in a greatly increased amount of recorded data. The current method of data analysis is not able to deal with the increased amounts of data. The goal of this project was to provide algorithms that perform data reduction and near-real-time analysis of seventeen key parameters. The team integrated the algorithms into a digital signal processor that quickly performs data reduction and analysis. A graphical user interface was developed to provide experimenters a convenient way to observe data as it is being analyzed.

ELECTRICAL AND COMPUTER ENGINEERING

TITLE: Power Line Communication
NUMBER: ECE 06.4
SPONSOR: The Boeing Company
SPONSOR LIAISONS: Roger vonDoenhoff, Dr. Sudhakar Shetty
FACULTY ADVISOR: Prof. Agnieszka Miguel
STUDENTS: Andrew Howe, Marcus Maurer, Sarah Mansa, Melvin Lee,
                    Baljinder Singh

Boeing is always looking for ways to reduce the weight of its airplanes in order to improve fuel efficiency and production costs. One way to reduce weight is to remove the network cables that transmit information on the airplane and replace them with wireless systems. However, these wireless systems create their own issues such as spectrum management. Boeing asked the team to develop a second alternative to the network cables that uses the existing power wiring on the plane to transmit information. The team used home power line adaptors to set up a network that can meet stringent airplane requirements. The network operates on 400Hz power, has a throughput of 50Mbps, displays minimal susceptibility to electromagnetic interference (EMI), and produces limited electromagnetic interference emissions.

TITLE: Power Factor Correction with Inrush Current Limiting and Output
                    Short-Circuit Protection
NUMBER: ECE 06.5
SPONSOR: Honeywell, Inc.
SPONSOR LIAISONS: Steve Lawson, Art Nace
FACULTY ADVISOR: Prof. Xusheng Chen
STUDENTS: Richard Johnson, Michael Mitchell, Chris Shaughnessy,
                    Edwin Tanumulia

Honeywell, Inc. is interested in the design and manufacturing of a power factor correction circuit topology with inherent inrush current limiting and output short circuit protection. The new requirements for power supplies of the aviation industry, which are to handle a 115 V AC input and frequency ranging from 360 Hz to 800 Hz, call for power factor correction to shape the input current so as to make it in phase with the input voltage. The power factor correction circuit must also minimize the harmonic distortion of the input current. In addition to power factor correction, inrush current limiting and output short circuit protection are vital for the safety of the power supply. The new design simplifies the circuit by incorporating a new integrated circuit along with a new circuit topology. This design replaces the previously used power factor correction circuit that requires a separate circuit to do inrush current limiting and short circuit protection.

TITLE: Advanced Truck Network Connections
NUMBER: ECE 06.6
SPONSOR: PACCAR
SPONSOR LIAISONS: Rusty Lhamon, Mark Fredrickson
FACULTY ADVISOR: Prof. Dat Tran, S.J.
STUDENTS: A.K. Araga, Cyril Castaner, Jock Bovington, Nathan Wickstrom

PACCAR, the manufacturer of Kenworth, Peterbilt, and DAF trucks, is setting itself apart from its competition by providing advanced technology in its trucks. PACCAR Information Technology Division has requested that the team research enhancements to the vehicle electronics platform and demonstrate a working prototype. The team evaluated several enhancements to the existing system and integrated these enhancements into the platform.

ELECTRICAL AND COMPUTER ENGINEERING

TITLE:	GPU-Based Image Processing, Real Time JPEG CODEC Feasibility Study
NUMBER:	ECE 06.7
SPONSER:	Philips Ultrasound
SPONSER LIAISONS:	Rob Trahms, Grant Jorde, Dan Morrison, Guo Tang
FACULTY ADVISOR:	Prof. Agnieszka Miguel
STUDENTS:	Kiranpreet Dhanoa, Gunawan Julianto, Rajinder Singh, Eric Rust

Currently, Philips Medical Systems employs a custom-built integrated circuit (IC) that performs image compression on their diagnostic ultrasound machines. The company wishes to reduce the cost of the instrument by transferring the processing load from its custom-made IC onto the graphics processing unit (GPU) of a video card. The company asked the team to design and implement a software codec that compresses ultrasound images appearing on the screen. The team used DirectX and High Level Shading Language (HLSL) to program the GPU. The programmable pipeline of a GPU has been utilized to perform a significant portion of the JPEG encoding/decoding processes, minimizing the computational loading of the system CPU and thus making the CPU available for other tasks. The compression algorithm follows the international baseline JPEG format standard and delivers compressed images at a rate of 60 frames per second.

TITLE:	Union Street Substation Network Restoration
NUMBER:	ECE 06.8
SPONSOR:	Seattle City Light
SPONSOR LIAISON:	Dix Fulton
FACULTY ADVISOR:	Prof. Xusheng Chen
STUDENTS:	Emil Aranda, Kun Chin Chien, Daniella Nipper, Assane Sall, Jianzhao Wei

Seattle City Light asked the team to solve a problem created by the current configuration of distribution feeders at the Union Street substation. When there is a total loss of power to the substation, circuit breakers are closed remotely from the System Control Center in Ballard, energized one at a time. Load connected to the networked feeders is too large to be picked up by a single circuit breaker, which creates an overload condition. To resolve this problem, Seattle City Light asked the team to redesign the system to automatically and simultaneously open and close multiple circuit breakers at the substation. The team used a Siemens TG5700 to automatically control the substation circuit breakers.

COMPUTER SCIENCE

TITLE:	Serial Communication Testing: Error Simulation
NUMBER:	CSSE 06.1 (in conjunction with ECE 06.1)
SPONSOR:	AREVA T&D
SPONSOR LIAISON:	David Allen, Kevin Cheung
FACULTY ADVISORS:	Prof. Robert Heeren, Prof. David Joslin
ECE STUDENTS:	Craig Lay, Grace Chen, Mohammed Al Sheraifi
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TITLE:	Photo Frame Widget Development for JamJar
NUMBER:	CSSE 06.2
SPONSOR:	Adobe Systems Inc.
SPONSOR LIAISONS:	Mike De Laurentis, Chris Wyman
FACULTY ADVISOR:	Prof. Adair Dingle
STUDENTS:	Andy Gerlicher, Jonathan Okuda, Dudley Pajela, Amy Sutedja

Adobe Systems has developed a new shared visual environment, with the codename JamJar, for collaboration between small groups over the Internet. This environment uses a widget-based system to place real-time interactive objects on the canvas. Adobe asked the team to propose a new widget idea and, thus, test third-party widget development. The team proposed a photo frame widget that allows the decoration and embellishment of photos placed on the canvas. The team identified and recorded issues with widget development from the third party perspective.

TITLE:	Improving Predictions using Evolutionary Theories
NUMBER:	CSSE 06.3
SPONSOR:	Intelligent Results
SPONSOR LIAISON:	Rob Jasper
FACULTY ADVISOR:	Prof. David Joslin
STUDENTS:	Justin Terada, Hoa Vo

Intelligent Results is a company that provides their clients with prediction modeling software. Their two main products are focused on financial institutions and customer service. Currently, their feature financial product has a large set of data that is being provided by the customers but is not being used in the software. Intelligent Results asked the team to research possible strategies to use this data to make more accurate predictions. Combining Intelligent Results's primary algorithm and the team's experience with genetic algorithms, the group developed new strategies to analyze the data and derive assessments. The results of the research will help Intelligent Results effectively use all of their data, as well as add to the general wealth of information available to the data mining community.

COMPUTER SCIENCE

TITLE: Noetix Excel Plug-in
NUMBER: CSSE 06.4
SPONSOR: Noetix
SPONSOR LIAISON: Craig Lee
FACULTY ADVISOR: Prof. Eric Larson, Prof. Yingwu Zhu
STUDENTS: Omar Al-Faresi, Justin Collins, Eric Nitiutomo, Matthew Skibbs

Noetix specializes in improving access across heterogeneous business information management systems. Noetix has implemented web-based solutions that provide the ability for customers to access and manipulate their data. In order to expand the options available to Noetix customers, the team designed and built an Excel plug-in that acts like the existing web-based client. Since Excel is widely adopted by businesses, this plug-in provides a convenient way for customers to access and manipulate their data in a familiar environment.

TITLE: Nordstrom Package Tracker
NUMBER: CSSE 06.5
SPONSOR: Nordstrom
SPONSOR LIAISON: Bill Tucker
FACULTY ADVISOR   Prof. Jeff Gilles
STUDENTS: Mark Evans, Travis Roberson, James Dooley,
                                 Sugiarto Tjokrokusumo

Nordstrom's goal is to provide "seamless customer service." Customers at Nordstrom can choose to have items shipped from the store to their home or office and often request information on the shipment's status. At present, employees have no way of checking the status of a package without going through a lengthy process that may involve passing the customer off to another employee. The team constructed a system that will allow the employee to instantly access the shipment's status at the register, decreasing both the time the customer must wait for an answer and the work needed to get the answer. The new system will be integrated with the current point-of-sale system in use in all Nordstrom stores.

MASTER OF SOFTWARE ENGINEERING

Master of Software Engineering Projects Night
Bannan Center for Science and Engineering, Wyckoff Auditorium
June 8, 2006

The undergraduate teams present their work the morning of Friday, June 2. Master of Software Engineering classes are offered in the evening so that students can continue to work on their professional jobs during the day. Projects Night for Master of Software Engineering teams is the evening of Thursday, June 8, starting at 6:00 p.m. in the Wyckoff Auditorium located inside the Bannan Center for Science and Engineereing. Following team presentations, John D. Vu will give a talk, "Information Technology and Global Capability."

TITLE:	Boeing Linux Cluster GUI
NUMBER:	MSE 06.1
SPONSOR:	The Boeing Company
SPONSOR LIAISONS:	David Kohrn, Joe Van Dyk
FACULTY ADVISOR:	Prof. Roshanak Roshandel
STUDENTS:	Edington Watt, Reza Tehrani, Karl Wiegand

Boeing's Integrated Defense Systems is upgrading its simulation servers from Unix mainframes to Linux clusters. Unix mainframes, while very powerful, are proprietary, expensive, and difficult to maintain; Linux clusters are also very powerful, however, they are configurable, inexpensive, and easy to upgrade and enhance. Boeing asked the team to assist in the design and implementation of a cluster management interface that allows users to manage complex simulations on multiple clusters. The team was primarily responsible for building a reservation system that provides scheduling capabilities for multiple simulations, users, nodes, and clusters. The new reservation system allows Boeing to more fully control the behavior of their clusters, atomically schedule simulations, and work with multiple users to simultaneously fulfill computation requirements.

TITLE:	TUI Test Automation and Quality Report Automation
NUMBER:	MSE 06.2
SPONSOR:	Cisco Systems, Inc.
SPONSOR LIAISON:	Kian Shahla
FACULTY ADVISOR:	Prof. William Poole
STUDENTS:	Aparna Akula, Ahmad Alkabra, John Anderson, Brian VanGalder, Ramesh Vudathu, James Wang

Cisco Systems is a worldwide leader in networking products. The project team worked on two projects that directly support their Unity product.

1. A primary user interface of the 'Unity' product is the Telephony User Interface (TUI). The Telephony User Interface consists of a large series of telephone menu options that the user navigates. Testing the various paths through this system is time consuming and tedious. Significant cost savings can be gained by automating this process. The team assisted Cisco in the automation of the Unity testing.

2. The Quality Report compiles data from several sources and presents graphs and trends that are easy to read. This feedback enables the engineering team to make improvements in those areas which are problematic for Cisco's customers and continue to improve the overall quality of the product. The creation of this report is manual and very time consuming. Cisco asked the team to decrease hands-on effort and linear time through increased automation and more supportable infrastructure. The team developed the enhancements, reduced costs, and increased timeliness and visibility.

MASTER OF SOFTWARE ENGINEERING

TITLE:	Agile Project Management Tool
NUMBER:	MSE 06.3
SPONSOR:	Semantium Corp.
SPONSOR LIAISON:	John Resing
FACULTY ADVISOR:	Prof. William Poole
STUDENTS:	Byrd Rodsattro, Vance Grkov, Hank Hoek, Kevin Dix, Ken Meerdink

Semantium Corp. is a value-added-reseller (VAR) for Visual Knowledge (VK), a rapid application development environment that lets domain users build applications via modeling tools rather than programming languages. Recent enhancements to Visual Knowledge by the value-added-reseller were extensive and the project team participated in beta testing of the much improved Visual Knowledge development environment. The project team took part in the first training on the value-added-reseller enhancements and used them to partially implement a prototype of the Feature Driven Development Project Management methodology based on requirements gathered from David Anderson, author of *Agile Management for Software Engineering*. In addition to experimenting with Visual Knowledge, Semantium also wanted to make the One Page Management philosophy, as described in Riaz Khadem and Robert Lorber's book *One Page Management*, an important part of their company culture. The team implemented a model of the Gold Star/One Page Management approach using off the shelf software and then enhanced that model.

TITLE:	Washington Mutual VOCALS project
NUMBER:	MSE 06.4
SPONSOR:	Washington Mutual
SPONSOR LIAISON:	Bhanu Aluru, Tracy Zerbin
FACULTY ADVISOR:	Prof. Jeff Gilles
STUDENTS:	Nate Clinton, Mukesh Kumar, Prashant Mishra, Su Chuan Cheng, Dedy Hendro

Washington Mutual is a national bank providing personal, business and mortgage services. To continually improve customer satisfaction, Washington Mutual gathers feedback, processes it, and provides that data to internal teams. The process of gathering this data occurs via an end-to-end system consisting of surveying customers, aggregating the survey data into a data warehouse, and providing for a rich reporting system. Washington Mutual asked the team to build a management application to provide for creation, modification, and overall administration of the surveys and their components (including questions, questionnaires, and studies). The team built this application, based on the requirements of the Washington Mutual business teams, and provided a more streamlined, effective, and user-friendly system for survey management.

Featured Speaker John D. Vu

John Vu is a Technical Fellow and Chief Engineer at Boeing Information Technology. He has worked on several major airplane programs such as the 737, 777 and 787, including the integration of CATIA systems to support the development of new airplanes and leading company-wide software process improvement activities.

Prior to joining Boeing, John worked at Teradyne Semiconductor, Litton Industries, Motorola and GTE. He is a Visiting Scientist at the Software Engineering Institute (SEI) where he helped develop several Capability Maturity Models (SW-CMM, CMMI, P-CMM, and E-CMMs). As Senior Scientist at Carnegie Mellon University, John is currently conducting research on software trends in industry including process improvement, e-business, and outsourcing. He has authored several benchmarkings papers on these topics.

John is also a member of the Technical Advisory Board of IEEE Software, and Adjunct faculty at Carnegie Mellon University, Seattle University, and international universities in South Korea, Japan, China, India, and Hungary.

Information Technology and Global Capability

Information Technology is the "quiet revolution" that is changing the world. The internet that connects people together also connects countries and businesses together. No longer is it a company's ownership of capabilities that matters, but rather it is its ability to manage and make the most of critical capabilities, whether or not they reside on the company's balance sheet.

Information technology is a key economic enabler that could help transform many developing countries into economic powerhouses at the speed of the internet. In this presentation, the author will share his findings on the information technology capabilities of several countries and their economic development. Using the Capability Maturity Model Integration (CMMI) as the tool, the author conducted several benchmarking studies in Asia, Australia, and Europe. He concludes that there are vast amounts of potential capabilities that could be used to make up for global shortages in information technology skills. Therefore the U.S. needs to focus on certain critical skills that could bring higher value to business. As the world is changing fast, and as other countries are developing their capabilities, we need to look ahead for new opportunities and new skills to maintain our lead in information technology.

SPONSORING ORGANIZATIONS AND LIAISONS

We want to acknowledge with special thanks the organizations that sponsored projects in 2005-2006, and especially the liaisons representing the sponsors, who worked with the students throughout the year. The time these liaison representatives spent in consultation with our teams is much appreciated by the students and their faculty advisers. It is the liaisons who provide the history and background of each project, its relationship to other work in the sponsoring organization, and much of the technical direction that makes a project successful.

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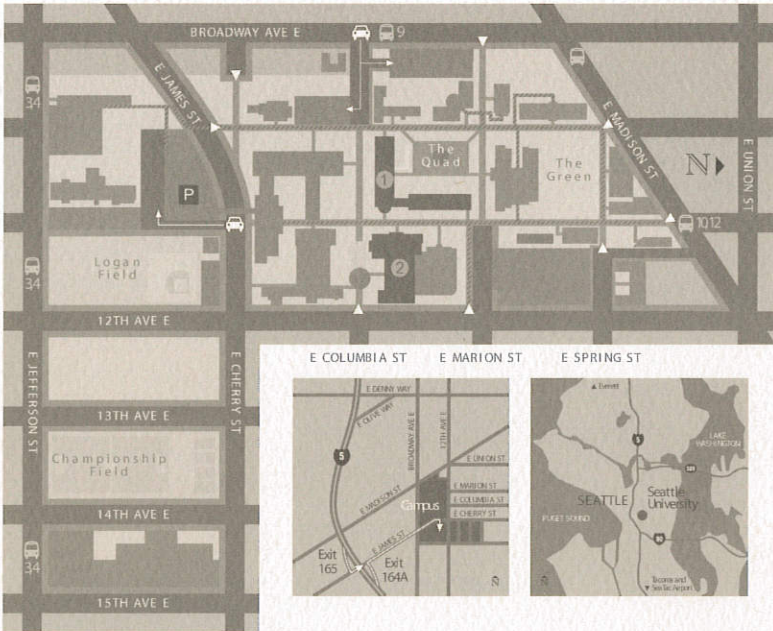
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① Bannan Center For Science & Engineering   ② Sullivan Hall (School of Law)

DIRECTIONS FOR PROJECTS DAY

- Take the James Street exit off I-5 (southbound exit #165, northbound exit #164Aand go east, up the hill.

- Continue east on James to Broadway. One block east of Broadway turn right into the Murphy Apartments Garage and park on the first level.

- Take the elevator in the northeast corner of the garage up to "SB" and take the skybridge across to the Student Center.

- Then take the elevator or main stairs down to the first floor and follow the "Projects Day" signs leading to Sullivan Hall.

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