

The Capstone Experience

Computer Science and Engineering
2009-2010



The Capstone Experience



CSE498
Collaborative Design
Professor Wayne Dyksen

The Capstone Experience provides the educational capstone for all students majoring in computer science at Michigan State University. Teams of students build significant software systems for corporate clients.

During the Capstone Experience, students

- design, architect, develop, test, and deliver a large software project for a corporate client,
- work in a team environment,
- develop written and oral communication skills,
- become proficient with software development tools and environments,
- consider issues of professionalism and ethics.



Corporate clients are local, regional, and national including Auto-Owners Insurance, Boeing, Chrysler, Ford, GE Aviation, GM, IBM, Medtronic, Meijer, Microsoft, Motorola, Raytheon, TechSmith, Terex, Toro, the Union Pacific Railroad, and Urban Science.

At the end of each semester, the College of Engineering sponsors Design Day, at which student teams from throughout the college showcase their capstone projects in the MSU Union.

On Design Day, computer science capstone teams demonstrate the software projects that they have designed, developed, and delivered for their corporate client. Teams compete for four awards, which are conferred by a panel of corporate judges.

We thank Auto-Owners Insurance of Lansing, Michigan for their continued support of Michigan State University and the Capstone Experience, including the printing of this Capstone Experience booklet.

Check out the Capstone Experience web site at www.capstone.cse.msu.edu.

For more information about the Capstone Experience or becoming a capstone project sponsor, contact Dr. Wayne Dyksen by email (dyksen@msu.edu) or by phone (517-353-5573).

The Capstone Experience, 2009-2010

Department of Computer Science and Engineering

Michigan State University

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Corporate Sponsors

Jeremy Briggs

University Staffing
Manager
Microsoft
Redmond, Washington



Microsoft® "Michigan State University's program in computer science has been a focal point for Microsoft for many years. We continue to recruit and hire outstanding graduates including 17 summer interns and 22 permanent hires in just the last five years."

Robert Feldmann

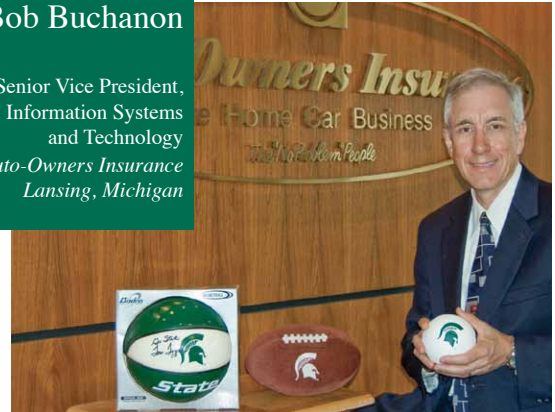
Vice President and
General Manager
The Boeing Company
Seattle, Washington



BOEING "The Michigan State computer science capstone course provides students with real-world experiences within the aviation and aerospace industries. The Boeing capstone teams continue to produce outstanding projects including a flight visualization system for the Navy's Blue Angels as well as complex scene rendering software for our simulation environments."

Bob Buchanon

Senior Vice President,
Information Systems
and Technology
Auto-Owners Insurance
Lansing, Michigan



"Auto-Owners Insurance is proud to be a long term capstone project sponsor. The business-like environment of the capstone experience provides a unique opportunity for students to develop into professionals. Our strategic partnership has enabled us to identify and recruit many outstanding MSU graduates."

Louise
Hemond-Wilson

Executive Consultant
IBM, Somers, New York



"At the beginning of the semester, each MSU capstone team receives a challenging business problem from their sponsor. These are not hypothetical or artificial problems. They very much resemble problems I see when working with clients and IBM teams in my role as a consultant for IBM. I have had the honor and pleasure of judging capstone teams' software solutions, examining their design, development and delivery. Repeatedly and consistently, the students, their projects, and their presentations impress me with their high degree of innovation, creativity and professionalism."

Capstone Alumni



Gina Chernoby

Software Development
Engineer in Test
Microsoft
Redmond, Washington

Microsoft *"Learning how to give and defend technical presentations is a key feature of the capstone experience, which I use often in my work at Microsoft."*

BS, CSE: May 2009
Hometown: Wyoming, Michigan

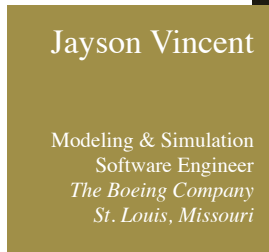


Caitlin Nelson

Software Developer/
Consultant
Crowe Horwath
Nashville, Tennessee

Crowe Horwath *"Working directly with a business client was a very valuable aspect of my capstone experience at MSU, particularly since it's now a very important part of my job at Crowe Horwath."*

BS, CSE: December, 2008
Hometown: East Lansing, Michigan



Jayson Vincent

Modeling & Simulation
Software Engineer
The Boeing Company
St. Louis, Missouri

BOEING *"My capstone project with Boeing was technically challenging, team-oriented, and concluded with a result that was rewarding to observe. Alongside summer internships and mentors who continually believed in me, my capstone project inspired me to pursue an exciting career in aviation and aerospace."*

BS, CSE: May 2005
Hometown: Mason, Michigan



Ben Pedersen

Software Test Engineer
TechSmith
Okemos, Michigan

TechSmith *"As a Michigan native, I wanted to pursue my career within the state. The capstone course project sponsors include companies of various sizes from throughout Michigan, including my company, TechSmith of Okemos, Michigan."*

BS, CSE: May 2010
Hometown: Lansing, Michigan

Fall 2009

Project Sponsors

We thank the following companies for their generous support of the computer science capstone course.

Auto-Owners Insurance Co.
Lansing, Michigan



The Boeing Company
St. Louis, Missouri



GE Aviation
Grand Rapids, Michigan



Meijer
Grand Rapids, Michigan



Motorola, Inc.
Schaumburg, Illinois



TechSmith Corporation
Okemos, Michigan



The Toro Company
Riverside, California



Urban Science
Detroit, Michigan



AUTO-OWNERS INSURANCE COMPANY APPLICATIONS FOR MOBILE DEVICES

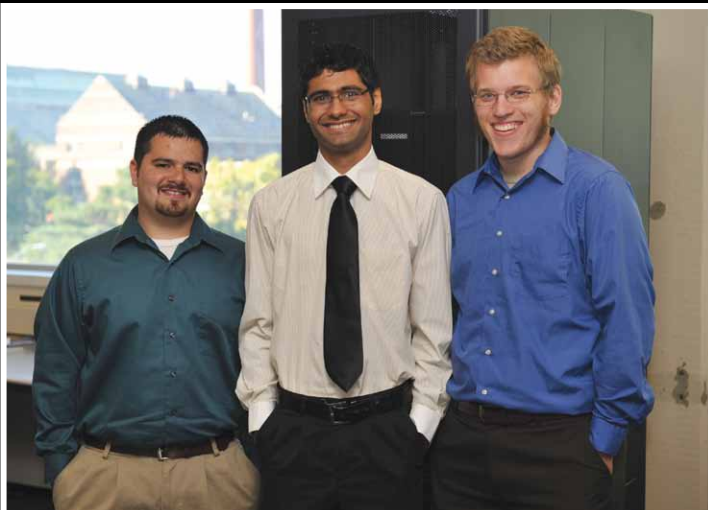
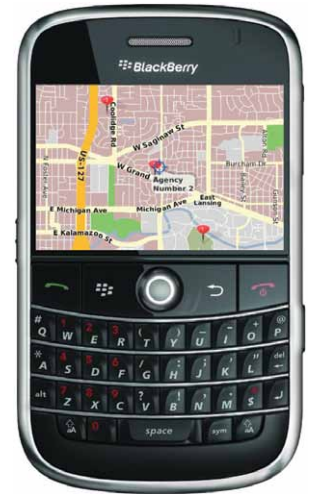
Auto-Owners Insurance was founded in 1916 and is among the premier insurance companies in the country. Understanding customer needs and providing great service are among the top priorities of the company.

With the increasing usage of mobile devices, it is becoming extremely critical for companies to provide mobile solutions for their customers.

Working with Auto-Owners Insurance, we developed a mobile application for the three major mobile platforms: iPhone, BlackBerry, and Windows Mobile. With our application, mobile users can locate nearby independent Auto-Owners agents on a map via GPS or searching by address or zip code.

Auto-Owners Insurance Independent Agents can also use our application to begin the formal insurance claim process to provide a speedy response their customers. Auto-Owners Insurance customers can gather information about a potential claim and send this information to their agent, or they can store it for later use.

As an example scenario, an Auto-Owners Insurance customer has a car accident. The customer would use our application to gather information about the accident, including pictures. The customer would then search for an Auto-Owners Insurance agent to contact them about their potential claim. The applications were developed using Objective-C for iPhone, Java for BlackBerry, and C# for Windows Mobile.



Michigan State University Team Members (left to right)

Ricardo Silva
St. Helen, Michigan

Lovelesh Chawla
Lansing, Michigan

Luke Hospadaruk
Ann Arbor, Michigan

Auto-Owners Insurance Corporate Sponsors

Bob Buchanan
Lansing, Michigan

Scott Lake
Lansing, Michigan

Peter Peltier
Lansing, Michigan

THE BOEING COMPANY SPARSE VIRTUAL TEXTURING

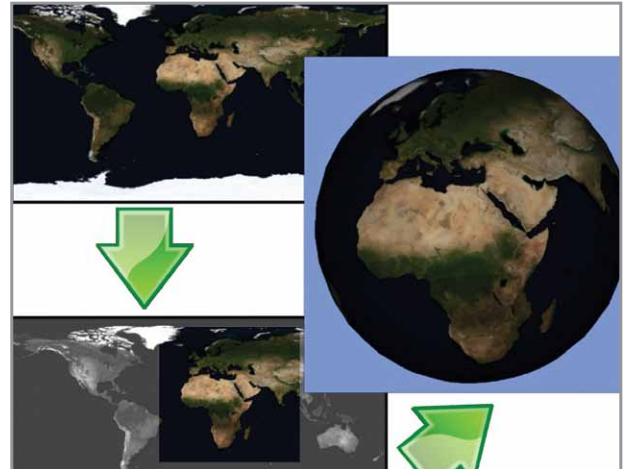
With drastic advances in visual technology, there has been an increasing demand for high definition imagery in games and simulation software. This is a problem, as high definition images can require larger amounts of memory than are available. The Sparse Virtual Texturing project is a tool that allows for the use of such images in real-time.

Current techniques for displaying textures (2D images placed upon 3D models) store the entire texture when only a small fraction of it may be visible on the screen. For example, when viewing the Western Hemisphere on a model of Earth, even though the Eastern Hemisphere cannot be seen it is still being loaded into memory.

The Sparse Virtual Texturing project only loads the parts of the texture that are actually being viewed. So when viewing the Western Hemisphere on a model of the Earth, this project does not store the portion of the texture containing the Eastern Hemisphere.

The extra memory that this technique frees up allows the use of higher definition textures than would normally be possible. The end result is higher quality visuals and more realistic simulation and game scenery, or the same quality visuals with better performance.

The Sparse Virtual Texturing project is implemented as an extension for OpenSceneGraph, and will be integrated into Boeing Modeling & Simulation Visual applications.



Michigan State University *Team Members* (left to right)

Adam Starks
Dallas, Texas

Patrick Ohren
Lansing, Michigan

James Drallos
Bloomfield Hills, Michigan

Alexander Kobylarek
Novi, Michigan

Boeing *Corporate Sponsors*

Pete Clive
St. Louis, Missouri

Matt Daniels
St. Louis, Missouri

Jonathon Marjamaa
St. Louis, Missouri

Lorne Mitchell
St. Louis, Missouri

Jayson Vincent
St. Louis, Missouri

Steve Yallaly
St. Louis, Missouri

GE AVIATION SYNTHETIC VISION DISPLAY

The GE Aviation Synthetic Vision Display makes the arduous task of piloting a plane much easier. And with the safety of the crew and passengers in mind, giving a pilot less to worry about could not be more important.

Using a flight simulator to stream flight data and reliable terrain information, a variety of unique flight instruments can be created. After being processed and sent via network to the client machine, a Synthetic Vision Display is rendered with several features designed to make a pilot's flight easier.

Accurately rendered terrain replaces the standard blue and brown rectangles, giving a pilot a better correlation between instrumentation and what would be visible from the main window. Further, the terrain rendered in the display simulates clear weather, allowing much greater visibility if actual weather conditions are poor.

Other features include coloration of rendered terrain to show relative elevation to the plane. In short, should the plane be in any danger of colliding with terrain, said terrain shall be rendered in red to ensure the pilot is aware of a need to avoid it. Terrain posing only a moderate risk will be rendered in yellow. Green terrain will not pose the pilot any risk.

Flight paths and airports are also shown on the Synthetic Vision Display, allowing the pilot greater situational awareness in even the worst conditions.

A pilot's job just got easier.



Michigan State University

Team Members (left to right)

Andrew Inman
Mount Clemens, Michigan

Justin Kienle
Clinton Township, Michigan

Jesse Hacker
Livonia, Michigan

Andrew Gerber
Hudsonville, Michigan

GE Aviation

Corporate Sponsors

Aaron Gannon
Phoenix, Arizona

Timothy Burns
Grand Rapids, Michigan

MEIJER ITS SCORECARD DASHBOARD

The Meijer ITS Scorecard Dashboard allows directors and managers within the Information Technology Services department a way to view summarized performance statistics regarding change and incident management.

A change consists of a modification to the current IT infrastructure. An incident refers to an issue that needs to be resolved. The Scorecard Dashboard summarizes key performance statistics regarding changes and incidents, and displays this information to end users through an intuitive graphical interface.

The Scorecard Dashboard utilizes stop-lighting, which allows users to view a manager's performance through a colored range scheme. Trending is accomplished through arrowed symbols that indicate a manager's performance over past periods. Charts allow for a visual comparison of statistics among managers that report to a specific director. Users can also drill down to a specific manager and view graphs that summarize performance and efficiency.

The Scorecard Dashboard is integrated with Microsoft Office SharePoint 2007. The capabilities and versatility of SharePoint ensures that the ITS Scorecard Dashboard will provide a useful tool for managers and directors.

The Scorecard Dashboard utilizes SharePoint 2007, ASP.NET and C#. Data is stored in SQL Server 2008.



Michigan State University Team Members (left to right)

John Rekoumis
Northville, Michigan

Matthew Wincek
Rochester, Michigan

Kareem Janoudi
Okemos, Michigan

Bing Shi
Clinton Township, Michigan

Meijer Corporate Sponsors

Randy Brower
Grand Rapids, Michigan

James Poll
Grand Rapids, Michigan

David Rodgers
Grand Rapids, Michigan

MOTOROLA

MOBILE USER GENERATED VIDEO SERVICE

From a son's first steps to a daughter's wedding day, home videos help us capture our most important memories so we can share them with our closest family and friends.

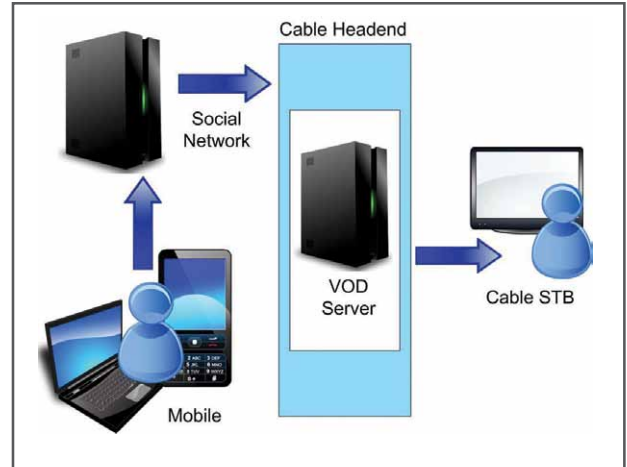
It is convenient to share videos through online applications for some generations, but not for all. However, it is easy to turn on a television set, and navigate and watch cable; generations have been doing this for years.

Motorola's Mobile User Generated Video Service has combined the convenience of an online application with the ease of cable television. Once created, a user generated video is uploaded to a central Video on Demand (VOD) server located at a cable headend where it is stored. The video is added to the appropriate customer's programming guide so it can be selected and streamed to the cable set top.

Users of the mobile application record a video with the camera on their phone, upload it, view it, give it a name and description, and associate buddies with it. Associating a buddy with a video gives them permission to view it on their cable set top box; they can easily turn on their television, navigate to the video they want to watch, click play, and the video is streamed from our server to their screen.

In addition, the developed VOD server can capture live television in the cable headend and make the captures available for cable users to view.

All services are programmed in Java and Objective-C, using a Glassfish application server, and a MySQL database.



MOTOROLA



Michigan State University

Team Members (left to right)

Ryan Ley
Okemos, Michigan

Robert Palmer
Livonia, Michigan

Philip Deschaine
Haslett, Michigan

Mary Fetsco
Sterling Heights, Michigan

Motorola

Corporate Sponsors

Kabe Vanderbaan
Schaumburg, Illinois

TECHSMITH

MICROSOFT TEAM SYSTEM CUSTOM CLIENT

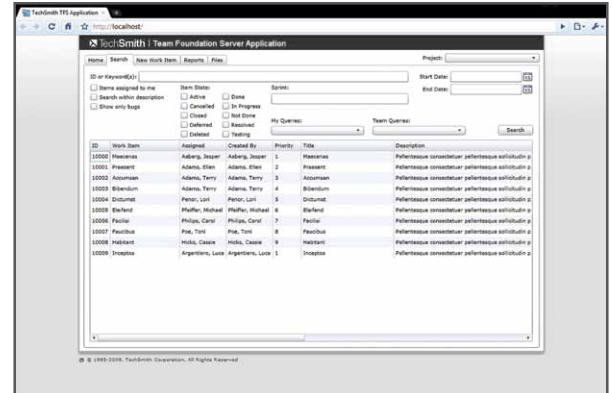
Software development in a team environment has the advantage of allowing talented engineers to collaborate their ideas towards a common focus. This design methodology helps TechSmith create cutting edge screen capture and recording software designed to help people communicate.

Team collaboration does, however, present some technological hurdles. Developing software in a team environment, engineers must worry about version control, progress tracking, build management, process guidance, and business intelligence. Bringing all of this information together in an accessible form proves to be difficult for software development.

At the core of their software development processes, TechSmith uses Microsoft Team Foundation System to collect and track collaborative development data from multiple individuals on multiple teams. Team Foundation System does not however, allow users easy and intuitive access to the information it collects.

With the Team System Client, users can access all of this collaboration data from one convenient web portal. From their computer workstation, users can view and modify information for key elements of software projects that they are working on.

This website application is created as a Microsoft Silverlight front-end to a C# .NET web service that can interact with Microsoft Team Foundation System 2008.



Michigan State University *Team Members* (left to right)

Jonathan Anderson
Perry, Michigan

Eric Henry
Dewitt, Michigan

Paul Dziadzio
Wixom, Michigan

Daniel Laboy
Portage, Indiana

TechSmith *Corporate Sponsors*

Dean Craven
Okemos, Michigan

Jim Dusseau
Okemos, Michigan

David Girdwood
Okemos, Michigan

THE TORO COMPANY

IRRIGATION DISTRIBUTION UNIFORMITY ANALYSIS

Recently, the study of climate change and the human impact on it has taken center stage in our everyday discussions. The Toro Company is taking a proactive role to minimize that impact as it relates to one of our most precious resources, water. Irrigation is a complex issue that involves balancing the type of sprinklers used and the way in which they are arranged. Toro constantly tests, measures and analyzes data collected from various sprinkler nozzles in an effort to evenly distribute water.

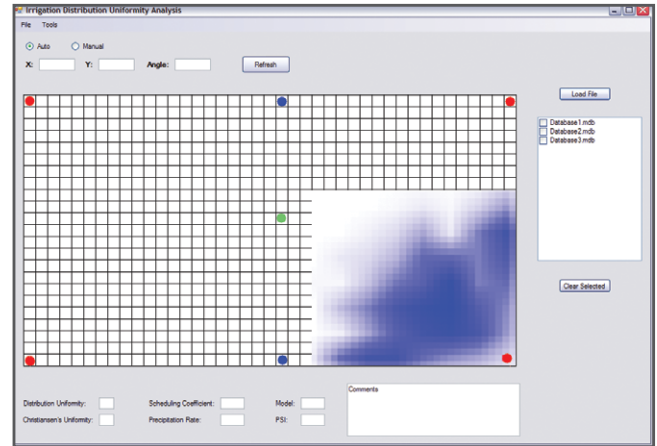
To help solve this problem, we have developed software that can take the information collected by Toro technicians and provide graphs and calculations in order to figure out the best solution.

The software works in two ways. In the automatic mode, the user can choose to look at only one sprinkler nozzle and select from one of several preset arrangements.

The software can also be used in a manual mode, which allows a person to look at several different sprinklers at the same time, moving them on a grid to whatever position they desire.

Both modes present the information as graphs known as densograms that illustrate the levels of water in an area by shading areas in various colors.

The Irrigation Distribution Uniformity Analysis tool is written in Visual C#, ASP.NET and Direct X.



Count on it.



Michigan State University Team Members (left to right)

James Harrison
Troy, Michigan

Andrew Giannini
Lansing, Michigan

Brett Janer
Bay City, Michigan

The Toro Company Corporate Sponsors

Nathan Fujimoto
Riverside, California

Andy Strother
Riverside, California

URBAN SCIENCE AUTOMOBILE DEALERSHIP DASHBOARD

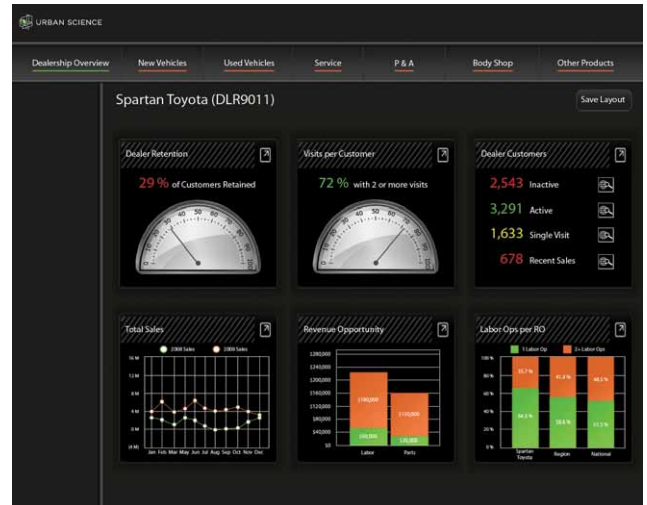
In evaluating all of the operations within a given automobile dealership, Urban Science provides several products that assess the performance and opportunity in different departments and activities. Given the current status of the automotive industry in struggling to maintain dealer profitability, products that give dealers insight into their operations have become more vital.

The Automobile Dealership Dashboard was created to provide this key information in a very effective and timely manner. This is important given the limited amount of time dealer management has to make decisions regarding this information.

The dashboard uses various charts, graphs, gauges, and data tables to display important information to not only specific automobile dealerships, but also to Original Equipment Manufacturers such as Ford, Chrysler, and General Motors.

Urban Science has developed several products that provide information on specific departments throughout an automobile dealership. The dashboard application acts as a portal by linking to these products via the Web to give users more information on what they are specifically looking for.

Usability and flexibility are two important factors in designing dashboard applications, which is why users of the Automobile Dealership Dashboard have the ability to customize pages to display the information they are interested in the most. This dashboard application was developed using C# and XAML along with a SQL Server 2005 database.



URBAN SCIENCE



Michigan State University Team Members (left to right)

Sean O'Donnell-Daudlin
Gross Pointe, Michigan

Garrett Radford
Westland, Michigan

Michael Cybulski
Ortonville, Michigan

Urban Science Corporate Sponsors

Mark Colosimo
Detroit, Michigan

Jay Lytle
Detroit, Michigan

Suzanne DuBois
Detroit, Michigan



Design Day Awards

CSE 498, Collaborative Design, is the senior capstone course for students majoring in computer science. Teams of students design, develop, and deliver a significant software system for corporate clients. The CSE capstone teams compete for four prestigious awards. The winners are selected on Design Day by a panel of distinguished judges.

Auto-Owners Insurance Exposition Award



CSE 498 capstone teams present their projects on Design Day in a variety of ways. Teams create and set up an exhibit where they demonstrate their software systems to and answer questions from Design Day attendees. Each team plays their project videos and answers questions for a panel of judges.

The CSE capstone team with the best overall Design Day performance is honored with the Auto-Owners Exposition Award, which is sponsored by Auto-Owners Insurance Company of Lansing, Michigan.

Team GE Aviation
Synthetic Vision Display



Jesse Hacker, Justin Kienle, Andy Inman, Andrew Gerber
Presented by Ron Simon of Auto-Owners Insurance

Chrysler Praxis Award



One of the hallmarks of CSE 498 capstone projects is that of praxis, the process of putting theoretical knowledge into practice. Teams apply a wide variety of information technologies to produce solutions to complex problems in areas such as business, engineering, computing, and science.

The CSE capstone team that engineers the software system that is the most technically challenging is recognized with the Chrysler Praxis Award, which is sponsored by Chrysler LLC of Auburn Hills, Michigan.

Team Boeing
Sparse Virtual Texturing



Adam Starks, Jim Drallos, Alex Kobylarek, Patrick Ohren
Presented by Karen Wrobel of Chrysler

Design Day Judges

David Asiala
Dow Chemical

Richard Enbody
Michigan State University

Adam Haas
Ford

Vandy Johnson
Medtronic, Inc.

Marty Strickler
Rose Packing

Michael Drazan
The Toro Company

Naim Falandino
Covisint

Louise Hemond-Wilson
IBM

Kevin Ohl
Business & Technology Consultant

Karen Wrobel
Chrysler LLC

Crowe Horwath Sigma Award



The CSE 498 experience represents the capstone of the educational career of each computer science major. An intense semester of teamwork produces impressive deliverables that include a formal technical specification, software, documentation, user manuals, a video, a team web site, and Design Day participation. The resulting sum, the capstone experience, is much greater than the parts.

The capstone team that delivers the best overall capstone experience is recognized with the Crowe Horwath Sigma Award, which is sponsored by Crowe Horwath LLP of Oak Brook, Illinois.

Team Motorola
User Generated Video Service for the iPhone



Rob Palmer, Ryan Ley, Mary Fetsco, Phil Deschaine
Presented by Dominic DiCicco of Crowe Horwath

TechSmith Screencast Award



Each CSE 498 capstone team produces a video that describes and demonstrates their software product. Starting with a storyboard and a script, teams use Camtasia Studio 6 to synthesize screen recordings, video, audio and other multimedia to produce their project videos.

And the TechSmith Screencast Award goes to...the CSE capstone team with the best project video. The award is sponsored by the creators of Camtasia Studio, TechSmith of Okemos, Michigan.

Team Auto-Owners Insurance
Applications for Mobile Devices



Lovelesh Chawla, Luke Hospadaruk, Rick Silva
Presented by Dean Craven of TechSmith

Corporate Sponsors

Dean Craven

Chief Technology Officer
TechSmith
Okemos, Michigan



"TechSmith capstone projects give students experiences with some of the latest computing trends including multi-media technologies, cloud computing, and Facebook applications, all of which makes them very marketable. Located a few miles from MSU in Okemos, Michigan, TechSmith continues to recruit and hire capstone graduates as our software developers."

Michael Drazan

Vice President,
Contractor Business
and CIO
The Toro Company
Minneapolis, Minnesota



"As a Design Day judge, I have evaluated capstone projects from many of the corporate sponsors. The software systems produced by the MSU students rival that of professional developers. The Toro sponsored capstone teams have delivered software that has been incorporated into our commercial products."

Vandy Johnson

Vice President,
Global IT
Infrastructure
Medtronic
Mounds View, Minnesota



Medtronic

"Medtronic is committed to providing innovative ways to help people manage their health. The mobile health management system developed by the Medtronic capstone team this spring is a prime example. The resulting iPhone app has been demonstrated at medical conferences and has been integrated into our hospital of the future."

Karen Wrobel

Head of Assembly
& Stamping Systems
Chrysler, LLC
Auburn Hills, Michigan



CHRYSLER

"When Chrysler recruits summer interns and permanent hires from MSU, the computer science capstone experience is an important factor on a student's resume. As both a project sponsor and a Design Day judge, I continue to be impressed by the quality of the software produced by capstone teams. The latest Chrysler capstone project will help us track key performance indicators at our Warren stamping plant."

Capstone Alumni

Stephanie
Emelander

Software Engineer
Lockheed Martin
Colorado Springs, Colorado



"The capstone course provided me with a real-world experience working in a team environment on a commercial software system for Toro, which has provided me with a strong foundation for the exiting opportunities that I have encountered at Lockheed Martin."

BS, CSE: May 2008
Hometown: Midland, Michigan



Ian De Silva

Staff Software Engineer,
IBM i Internal Tools
IBM
Rochester, Minnesota



"My capstone project with IBM gave me both valuable experience and visibility within the company that has helped shape and advance my career."

BS, CSE: May 2008
Hometown: Tulsa, Oklahoma



Rob Palmer

Software Developer
Auto-Owners Insurance
Lansing, Michigan



"The entire capstone course is designed to be a real-world, professional experience, which helps graduates transition from being students to professionals. Auto-Owners Insurance has a long history of capstone project sponsorship, which made me aware of the career opportunities here and inspired me to apply."

BS, CSE: December 2009
Hometown: Livonia, Michigan

Andy Kreling

Software Engineer
Google
Kirkland, Washington



"The capstone experience at MSU challenges students to build innovative software solutions to complex technical problems, which was great preparation for my job at Google."

BS, CSE: May 2008
Hometown: Kalamazoo, Michigan

Spring 2010

Project Sponsors

We thank the following companies for their generous support of the computer science capstone course.

Auto-Owners Insurance Company
Lansing, Michigan



The Boeing Company
St. Louis, Missouri



Chrysler
Auburn Hills, Michigan



GE Aviation
Grand Rapids, Michigan



Medtronic
Mounds View, Minnesota



Meijer
Grand Rapids, Michigan



Motorola, Inc.
Schaumburg, Illinois



Raytheon
Fort Wayne, Indiana



TechSmith Corporation
Okemos, Michigan



Terex
Westport, Connecticut



Urban Science
Detroit, Michigan



AUTO-OWNERS INSURANCE WEATHER INCIDENT VERIFICATION SYSTEM

When bad weather happens, insurance companies have their hands full with all the claims they receive. It is the job of the claims associates to determine whether a claim should be accepted or denied.

These often multi-million dollar decisions must be made very carefully. Proper research on recent weather events in the area of the claim will aid the associates in determining its validity.

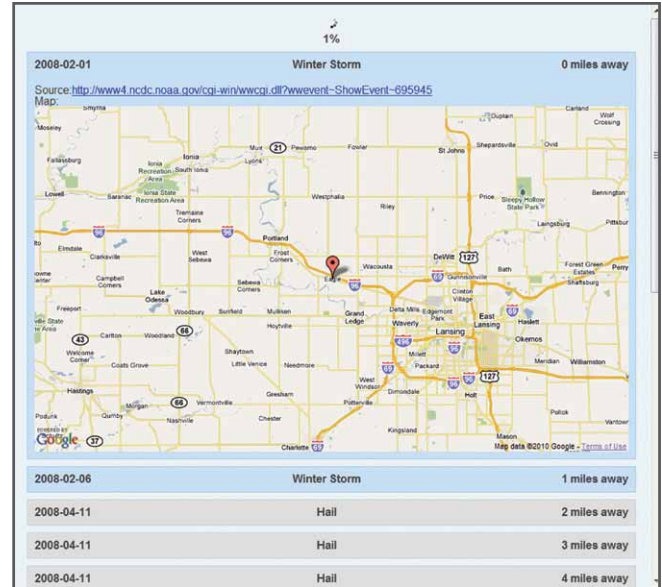
To aid Auto-Owners Insurance in this research, we have developed a Weather Incident Verification System.

This web application allows a claims associate to easily search the weather history for the location in which the claim was made. The results can then be compared to the claim to see if a weather event may have caused the damage.

Searching can be done by first entering a date, or date range. Then, the user may enter either an address, or a specific latitude and longitude. Policyholders can be searched by last name to look up their address as well.

Once the associate submits the information, the results are neatly displayed along with a map of the area. Individual events can be clicked on for more detailed information. Results can also be saved to a file for recordkeeping.

Although this program cannot decide the validity of the claim on its own, it may provide valuable information for the claims associate to consider in their decision.



Michigan State University Team Members (left to right)

Joseph Lockard
Lansing, Michigan

Evan Dontje
Dewitt, Michigan

Edward Waller
Okemos, Michigan

Auto-Owners Insurance Corporate Sponsors

Bob Buchanan
Lansing, Michigan

Scott Lake
Lansing, Michigan

Jim Walsh
Lansing, Michigan

Ed Keen
Lansing, Michigan

THE BOEING COMPANY

XML TEXTURE COMPOSITION

The amount of memory and power needed in graphics processing today is continually growing. Applications need a way to get as much power and memory out of as little resources as possible. Utilizing Sparse Virtual Texturing technology, the XML Texture Composition project allows ways to manipulate multiple image textures and draw them on a 3D model. The texture formats used maximize the amount of memory required to draw high-resolution images. The location and priority of how these textures are drawn will be decided through an XML text document loaded into the application.

Previous applications only allow one sparse virtual texture to wrap around the entire 3D object. This restriction does not allow Sparse Virtual Textures to be used to their maximum potential. The XML Texture Composition project extends this technology's functionality. Currently, multiple textures can be applied to a model at very precise user specified locations determined by the text document.

The sub feature of this project includes a menu option that allows the user to select an image and a location from a dialog box and place it as top priority on the 3D model at the specified location.

The XML Texture Composition project is implemented as an extension to Open Scene Graph. This project will also be integrated with the Boeing Company's modeling and simulation software.



Michigan State University

Team Members (left to right)

Jeremiah Cunningham
Livonia, Michigan

Marc Coleman
Lansing, Michigan

Jonathan Harris
East Lansing, Michigan

Jessica Parks
Ann Arbor, Michigan

The Boeing Company

Corporate Sponsors

Jayson Vincent
Saint Louis, Missouri

Jon Marjamaa
Saint Louis, Missouri

Lorne Mitchell
Saint Louis, Missouri

Pete Clive
Saint Louis, Missouri

Matt Daniels
Saint Louis, Missouri

Steve Yallaly
Saint Louis, Missouri

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MANUFACTURING DASHBOARD MIGRATION

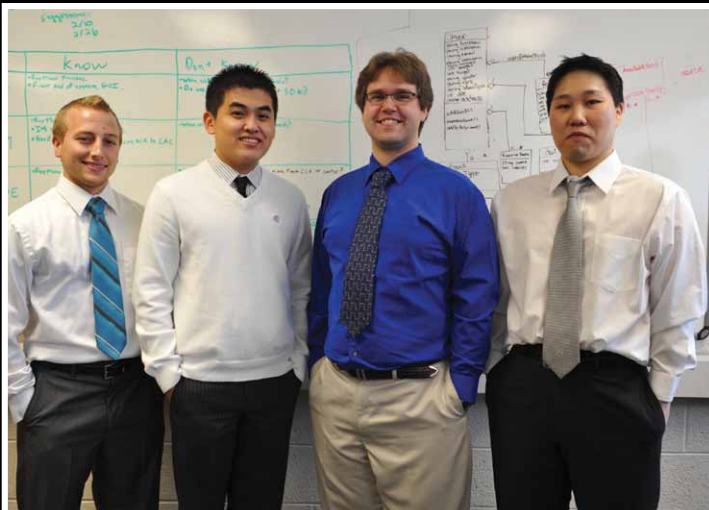
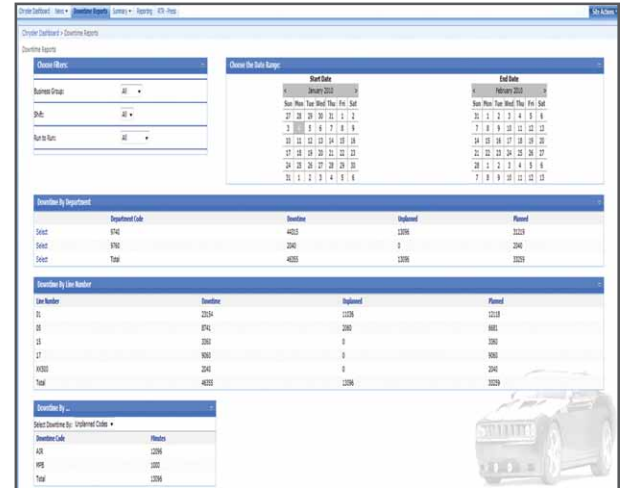
Currently Chrysler uses a dashboard to track key performance indicators for all of their plants. Managers can review this data to determine if company goals are being met and where improvements need to be made.

However, the current dashboard is a custom-made solution that has grown increasingly difficult to maintain and improve. Our project is to re-design this dashboard using modern methods, particularly Microsoft SharePoint Server, while preserving the functionality of the original. To make the project feasible within a semester, we focused on the Warren Stamping plant.

While the first goal of the dashboard migration is to increase maintainability, the second is improving usability. Currently, the dashboard offers a large variety of reports. Part of our task is to reduce the number of reports while providing the same information via drill down capability. If a particular piece of data presented in a table or chart is interesting to a user, they can click on it and get an expanded view.

On the right you can see an example page from our dashboard. This page displays downtime for parts of the plant and offers the users several filters for which data is displayed. In addition, when a department and line are selected from the tables at the top, the remaining tables reflect only data for that line.

Along with displaying overall performance data, the site will contain a more advanced news section. This section will display the overall news of the plant, as well as more specific news, such as Financial, Corporate, and Human Resources.



Michigan State University

Team Members (left to right)

Alex Walworth
Sturgis, Michigan

Jong Jang
Sterling Heights, Michigan

Ben Pedersen
Lansing, Michigan

Jun Lee
Seoul, South Korea

Chrysler Group LLC

Corporate Sponsors

Frederick A. Paredes
Auburn Hills, Michigan

Rui R. Liu
Auburn Hills, Michigan

Alicia V. Cummings
Auburn Hills, Michigan

Maurice Tedder
Auburn Hills, Michigan

Sandra D. Rose
Auburn Hills, Michigan

GE AVIATION

FLIGHT DECK LATERAL MAP DISPLAY

Given the safety critical task of piloting an aircraft, the aviation industry is continuously seeking to improve pilot performance. One such tool aimed at improving situational awareness is the Flight Deck Lateral Map Display (LMD). This software provides multiple views of an aircraft's situation, giving a pilot valuable flight data that might otherwise not be available.

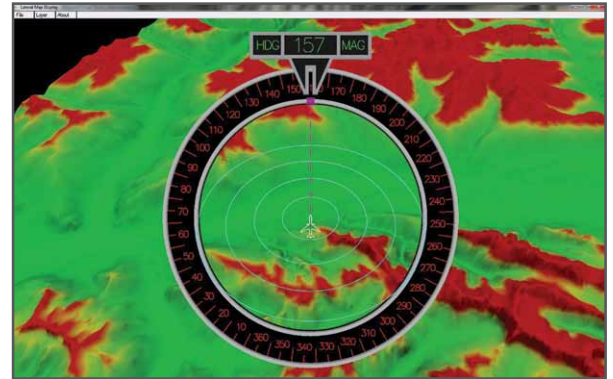
By utilizing flight simulation software to stream data over a simulated aircraft network, the LMD is capable of displaying a multitude of information in various layers.

Terrain elevation and distance are rendered in multiple ways. A top down (or plan view) rendering is displayed around the plane icon and is shaded depending on the theoretical danger level. Terrain that is significantly above the aircraft is color coded red while terrain significantly below the aircraft is colored green. A second form of display is a side (or profile) view where the danger levels are shaded in the same manner.

Other features include weather, waypoints, other air traffic, airports, state and country lines, wind speed, and ground speed. The weather layer uses a worldwide map to accurately display the current weather at a given location. Location data is derived using the aircraft's latitude and longitude and updates based upon rotation and zoom.

The Lateral Map Display is particularly useful when visibility is poor. Using this tool, the pilot has the ability to determine their heading, see their flight plan, and avoid hazards such as terrain, air traffic, and weather.

The LMD is written in C and utilizes the OpenGL API.



Michigan State University *Team Members* (left to right)

Jason Rigdon
Novi, Michigan

Jordan Clare
Westland, Michigan

Adam Dupler
Rochester, Michigan

Cory Sites
Grand Ledge, Michigan

GE Aviation *Corporate Sponsors*

Aaron Gannon
Grand Rapids, Michigan

Timothy Burns
Grand Rapids, Michigan

Dashiell Kolbe
Grand Rapids, Michigan

MEDTRONIC MOBILE HEALTH MANAGEMENT SYSTEM

In an effort to help patients manage their health we have developed the Mobile Health Management System. The goal of this product is to show the correlation between food and exercise choices and the patients' health. Patients will be able to track a wide range of goals that consist of weight, heart rate, blood sugar, and other various related health risks.

This product consists of both a web and iPhone application. Patients will be able to input their daily activities and view data from their implanted Medtronic devices. The correlation of this data reinforces healthy choices and helps patients actively participate in their rehabilitation.

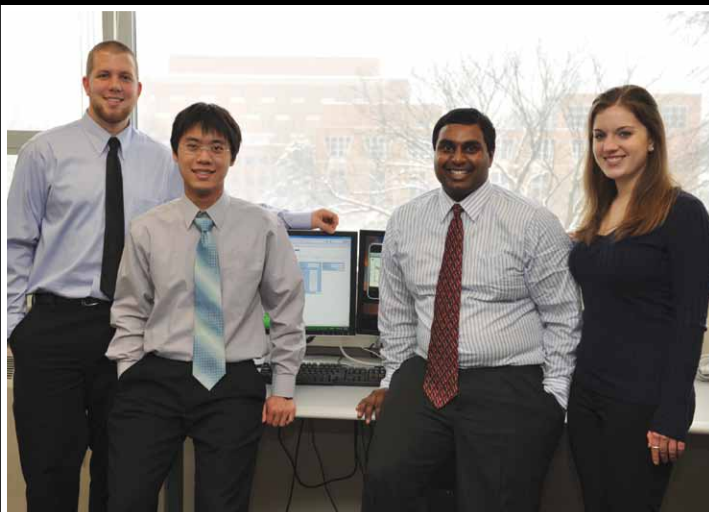
One example could include an overweight patient struggling with a chronic heart disease. The patient could use the application to track weight, heart rate, and sodium levels. The activity data that they entered can be viewed along with data from their implanted Medtronic devices. Over time, the patient can see how their health has been affected by their lifestyle choices.

Medtronic's mission is to contribute to human welfare by the application of biomedical engineering to alleviate pain, restore health, and extend life. For over 40 years they have been transforming the way the world treats chronic diseases so patients can live a fuller life.

The web application is developed in Javascript and Groovy and Grails. The iPhone application is developed in Objective-C. The database used is MySQL.



Medtronic



Michigan State University Team Members (left to right)

Michael Keeseey
Portage, Michigan

Kevin Chen
Taichung, Taiwan

Karthik Chokkaram
Ann Arbor, Michigan

Meghan McNeil
Farmington Hills, Michigan

Medtronic Corporate Sponsors

Peter Ericksen
Mounds View, Minnesota

Michael Green
Mounds View, Minnesota

Vandy Johnson
Mounds View, Minnesota

Scott Mark
Mounds View, Minnesota

Karin Petty
Mounds View, Minnesota

Mike Stuedemann
Mounds View, Minnesota

MEIJER

CHIEF INFORMATION OFFICER DASHBOARD

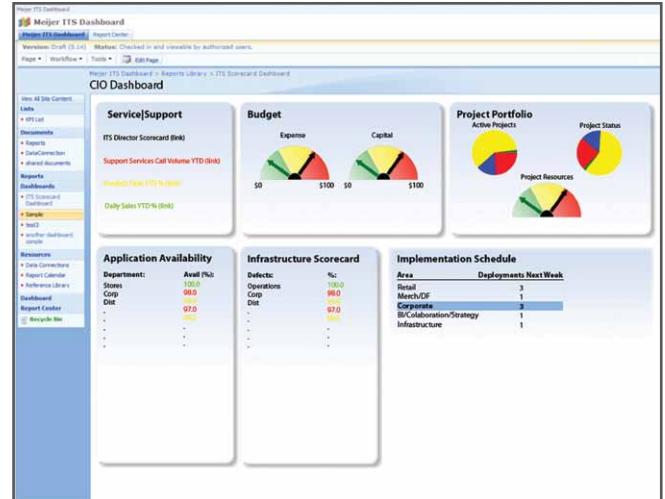
For retail giants like Meijer, information technologies provide strategic competitive advantages for everything from point-of-sale systems to inventory control. The Chief Information Officer is responsible for leading and managing information technology for the entire enterprise.

What we have come up with is a dashboard, that is built upon Microsoft SharePoint, which has several “widgets” that all help to portray different information, whether it is financial information or period support call volumes or any other performance metric related to the ITS department.

Each one of these “widgets” portrays information in a way that is best fitting for that information. This ranges from pie charts, to graphs, to color-coded text.

While all of these “widgets” provide a brief glimpse into the performance metrics, some also allow for a “drill-down” into the information to see specific parts of that performance metric. “Drill-down” simply means you can click to see a more detailed view of that performance metric.

The hope of our project is that we can provide a highly customizable and interactive dashboard to Meijer’s CIO and ITS Managers. This dashboard allows the user to quickly glance at key department metrics, highlighting areas that are under performing, and allowing for quick “drill-down” to more detailed information. By providing this dashboard, the user can potentially save valuable minutes by only spending time on areas that require their attention.



Michigan State University Team Members (left to right)

Jack Fritz
Dewitt, Michigan

Joseph Blossom
Rockford, Michigan

Russell Valice
Troy, Michigan

Meijer Corporate Sponsors

Randy Brower
Grand Rapids, Michigan

James Poll
Grand Rapids, Michigan

David Rodgers
Grand Rapids, Michigan

MOTOROLA MOBILE USER GENERATED VIDEO SERVICES

Video on demand services like TiVo or Comcast On Demand have become very popular over the past decade because of the many benefits they offer to their users. However, these benefits are limited. You can only watch shows and movies you record or watch the programs provided to you by your service provider. Now, think of the ability to take control of this service. The ability to watch your own videos anywhere you or your friends and family watch TV.

We have developed a system that allows users to upload their own content and make this content accessible via a cable box. The user does this by uploading a video from their computer, iPhone, or Android device to a web service. The user gives the video a name and description, and then selects which of their buddies can view the video.

Once the video is uploaded to the service and buddies are associated, the service alerts the appropriate cable headend that a new video is available to be viewed. The headend then downloads the video and converts it to a stream-capable format and saves it to be watched at any time.

The user can navigate through their list of movies on their cable box and select which one they want to watch. Upon selecting a video, it is then streamed to their television.

All services are implemented in Java, deployed on a Glassfish application server and use a MySQL database. The Android app is developed in Java and the iPhone app in Objective-C using Xcode. All Java is developed in Eclipse.



MOTOROLA



Michigan State University Team Members (left to right)

Jonathan Szykowski
Holly, Michigan

Brandon Malicoat
Frankenmuth, Michigan

Kurt Seippel
Canton, Michigan

Robert Gaul
Standish, Michigan

Motorola Corporate Sponsor

Kabe Vanderbaan
Schaumburg, Illinois

RAYTHEON

CAMERA CONTROL APPLIANCE

One of Raytheon's primary functions is to provide security solutions for clients. A current problem is accessing and controlling pan-tilt-zoom security cameras. This is a problem because there are many different types of security cameras, and many different protocols are used to communicate with them. This is why Raytheon wishes to have a camera control appliance that provides a way to easily communicate with many different types of security cameras.

The camera control appliance is a software application that will allow remote sensors, such as security cameras, to communicate with Raytheon's Command Assurance - Civil situational awareness software. The appliance must be extensible, meaning it must be designed to easily allow the addition of new sensors. It will allow clients to effortlessly integrate various types of security cameras into their local networks and Raytheon's various situational awareness tools.

The camera control appliance integrates with Raytheon's Command Assurance software, Sensor Resource Manager and Command, Control and Display Equipment. The end result allows the sensors to be controlled and visually represented through Google Earth.

The camera control appliance uses the standards established in the ICD-101A security document. These standards are used as a guide to create an XML-based standard for universal communication with sensors.



Raytheon



Michigan State University

Team Members (left to right)

Scott Bishop
Rochester Hills, Michigan

Phillip Studans
Huron, Ohio

Austin Gregory
Bloomfield Hills, Michigan

Tom Parker
Grand Rapids, Michigan

Raytheon

Corporate Sponsors

John Dinh
Ft. Wayne, Indiana

David Peter
Ft. Wayne, Indiana

Barry Peterson
Ft. Wayne, Indiana

Dan Sheline
Ft. Wayne, Indiana

TECHSMITH

FACEBOOK STUDY GROUP APPLICATION

Study groups are common for college classes as well as certain K-12 ones. Some challenges students in these classes must often overcome include finding others interested in a study group, distributing content, organizing meetings, and identifying as well as eliminating people harmful to the group.

The Facebook Study Group Application addresses each of these challenges. On its own, social networking provides untapped opportunities for study groups and academic collaboration. This application makes use of that potential to create an environment where students can spread and obtain knowledge. It furthermore enables the quick and easy sharing of various types of class content. The incorporation of existing TechSmith products such as Camtasia and Jing allow students to get the maximum benefit of the Facebook Study Group Application's content sharing capabilities.

The application features forum-like discussion capabilities with real time response where content can be posted and accessed. It also uses internal groups with various configuration options similar to Facebook. Calendars are available for tracking deadlines and important dates. Finally, it allows the creation and tracking of individual user rankings based on accomplishments or other user input.

This Facebook application was developed using various programming languages including PHP and JavaScript.



Michigan State University Team Members (left to right)

Chan Choi
East Lansing, Michigan

Douglas Sheffer
Williamston, Michigan

Trevor Jelneck
Saline, Michigan

Ryan Oswald
Sterling Heights, Michigan

TechSmith Corporate Sponsors

Dean Craven
Okemos, Michigan

Jason Eagleston
Okemos, Michigan

Mike Simons
Okemos, Michigan

TEREX ENTERPRISE FEATURES FOR ECOMMERCE

Online shopping has grown to be a common experience in the past decade and will become even more common in the coming years. Terex is an example of a company that sells their products to dealers from their online store.

Terex has dealers located all over the globe, often times in places that do not have a permanent internet connection. Terex has the desire to allow customers to access the electronic catalog where internet connection is not available.

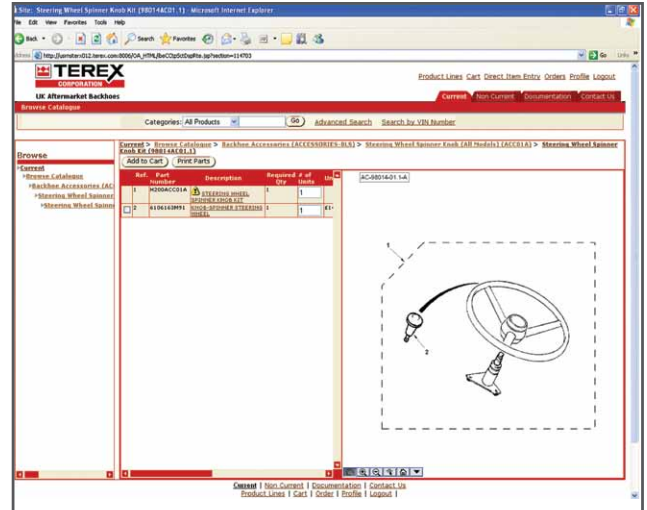
One of the features of the software is the ability to browse and search the product database while disconnected from the internet. The customer may also add items to a shopping cart and submit the cart when an internet connection is available.

When a customer selects a product they will be shown more information about it. This information is shown in the document viewing area. This new feature shows all of the documents related to the product they are currently looking at, such as images, PDF's, and videos.

The customer may also choose to download a PDF manual for the product. This manual is created by the software and includes all related product information.

Due to the requirement to run on any customer's laptop, the software is compatible with older computers.

Enterprise Features for eCommerce is written in Java. The software looks like a web page even when the customer is not connected to the internet and is just as easy to use.



Michigan State University Team Members (left to right)

Stephen Wakeford
Lansing, Michigan

Edward Messing
Sandusky, Michigan

Nicholas Gregg
Lansing, Michigan

Terex Corporate Sponsors

Greg Fell
Westport, Connecticut

Vijay Gupta
Westport, Connecticut

Ravi Kanth
Plano, Texas

URBAN SCIENCE

AUTOMOBILE DEALER APPS FOR MOBILE DEVICES

In today's rapidly changing business environment, automotive dealerships have to make important decisions to remain profitable. But in order to make these decisions, an automobile dealer has to be well informed about how they are performing.

Dealerships use various categories of statistical data to assess themselves in a variety of areas such as sales, repair, and customer satisfaction. Previously, an automobile dealer had to log onto their desktop or laptop computer in the office or home to get these statistics.

Now a dealer can access these statistics on their mobile device, regardless of where they are. By using the Automobile Dealer Apps for Mobile Devices, a dealer has the power to view their performance at their fingertips.

Our application gives users the ability to access dealership performance statistics while "on the run." Not only does the application allow users to conveniently access statistical data from a cellular device, the application also displays the data in an easy to read fashion via charts, graphs, and maps.

The application's search functionality, ability to sort dealership performance across numerous key performance indicators, sleek user interface, and slew of other great features make the Automobile Dealer Apps for Mobile Devices the perfect tool for automobile dealers that are constantly on the go.



URBAN SCIENCE™



Michigan State University Team Members (left to right)

Jeffrey Meador
Troy, Michigan

Shaun Gautz
Monroe, Michigan

Kaalem Lucky
Detroit, Michigan

Joshua Mackaluso
Vicksburg, Michigan

Urban Science Corporate Sponsors

Mark Colosimo
Detroit, Michigan

Randy Berlin
Detroit, Michigan

Suzanne DuBois
Detroit, Michigan

Design Day Awards

CSE 498, Collaborative Design, is the senior capstone course for students majoring in computer science. Teams of students design, develop, and deliver a significant software system for corporate clients. The CSE capstone teams compete for four prestigious awards. The winners are selected on Design Day by a panel of distinguished judges.

Auto-Owners Insurance Exposition Award



CSE 498 capstone teams present their projects on Design Day in a variety of ways. Teams create and set up an exhibit where they demonstrate their software systems to and answer questions from Design Day attendees. Each team plays their project videos and answers questions for a panel of judges.

The CSE capstone team with the best overall Design Day performance is honored with the Auto-Owners Exposition Award, which is sponsored by Auto-Owners Insurance Company of Lansing, Michigan.



Team GE Aviation
Flight Deck Lateral Map Display

Jason Ridgon, Jordan Clare, Cory Sites, Adam Dupler
Presented by Ron Simon of Auto-Owners Insurance

Chrysler Praxis Award



One of the hallmarks of CSE 498 capstone projects is that of praxis, the process of putting theoretical knowledge into practice. Teams apply a wide variety of information technologies to produce solutions to complex problems in areas such as business, engineering, computing, and science.

The CSE capstone team that engineers the software system that is the most technically challenging is recognized with the Chrysler Praxis Award, which is sponsored by Chrysler LLC of Auburn Hills, Michigan.



Team Boeing
XML Texture Composition

Jeremiah Cunningham, Jessica Parks, Marc Coleman, Jonathan Harris
Presented by Rick Rose of Chrysler

Spring 2010

Design Day Judges

Michael Drazan
The Toro Company

Naim Falandino
Covisint

Vandy Johnson
Medtronic, Inc.

Rick Rose
Chrysler LLC

Karen Wrobel
Chrysler LLC

Richard Enbody
Michigan State University

Adam Haas
Ford

Kevin Ohl
Business & Technology Consultant

Damian Winslow
Dow Chemical

Urban Science Sigma Award



URBAN SCIENCE™

The CSE 498 experience represents the capstone of the educational career of each computer science major. An intense semester of teamwork produces impressive deliverables that include a formal technical specification, software, documentation, user manuals, a video, a team web site, and Design Day participation. The resulting sum, the capstone experience, is much greater than the parts.

The capstone team that delivers the best overall capstone experience is recognized with the Urban Science Sigma Award, which is sponsored by Urban Science of Detroit, Michigan.

Team Motorola
Mobile User Generated Video Service



Kurt Seippel, Robert Gaul, Jonathan Szykowski, Brandon Malicoat
Presented by Mark Colosimo and Randy Berlin of Urban Science

TechSmith Screencast Award



Each CSE 498 capstone team produces a video that describes and demonstrates their software product. Starting with a storyboard and a script, teams use Camtasia Studio 6 to synthesize screen recordings, video, audio and other multimedia to produce their project videos.

And the TechSmith Screencast Award goes to...the CSE capstone team with the best project video. The award is sponsored by the creators of Camtasia Studio, TechSmith of Okemos, Michigan.

Team Medtronic
Mobile Health Management System



Michael Keesey, Kevin Chen, Karthik Chokkaram, Meghan McNeil
Presented by Dean Craven of TechSmith



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**For more information about
the Capstone Experience or
becoming a project sponsor, contact**

Dr. Wayne Dyksen
Professor of Computer Science and Engineering
3149 Engineering Building
Michigan State University
East Lansing, Michigan 48824
dyksen@msu.edu
(517) 353-5573