

Mid-Southeast Chapter



of the ACM

For information on the 2011 Fall Conference, select
the conference link from the official chapter website:
www.acmmidsoutheast.org

**A special “thank you” goes to Cengage Learning for
lending financial support to this year’s conference.**

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Message from the Chapter Chair

On behalf of the Association for Computing Machinery (ACM) Mid-Southeast Chapter executive committee, welcome to the 52nd annual fall conference in Gatlinburg, Tennessee.

Did you know that the Mid-Southeast Chapter of the ACM is one of oldest active chapters in the ACM? Some people attending this year's meeting have attended dutifully for 33 years and longer. Some of you may be attending for the first time. Regardless of whether you are an old-timer or first-timer, we think you will depart from Gatlinburg with the feeling that this meeting provides a unique opportunity to share experiences with people who share many of the concerns and problems that we all deal with as students or professionally

Conference participation is at an all-time high this year. Three years ago, we increased the number of time slots available for presentations to 76. This year the program has been expanded even more. Over the last 10 years, student participation has soared. This has made student judges' work much more difficult than in the past — not a bad problem to have — at least if you are not a judge.

A great deal of work for the conference occurs behind the scenes. The responsibilities of the chapter chair and secretary pale compared to those of the treasurer, conference chair, program chair, and student judges chair. I recall someone saying that he "had always found this a well-run conference." It is well run because of the efforts of people like Bob Bradley, Randy Smith, Greg Kawell, and Brian Toone, and others who preceded them through the years. Please thank them for their considerable efforts. And don't forget the afore-mentioned judges. They do journeyman's work for most of the day.

Once again, welcome to our annual conference. I hope you can take the opportunity to meet and greet friends in the hospitality suite and during free times during the day, and you can take some extra time to get out and enjoy the Smoky Mountains. It is a great time of the year to be here.

Jim Clark
University of Tennessee–Martin

Chapter Officers

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Student Paper Competition Judges

Chair

Brian Toone, Samford University

Undergraduate 2-year

Jimmy Vandergriff, Austin Peay State University

John Nicholson, Austin Peay State University

Joyce Crowell, Belmont University

Undergraduate 4-year

Ashraful Chowdhury, Georgia Perimeter College

Kevin Harris, Nashville State Community College

John Stamey, Coastal Carolina University

Nancy Smithfield, Austin Peay State University

Melissa Wiggins, Mississippi College

Wayne Summers, Columbus State University

Masters

Jimmy Vandergriff, Austin Peay State University

John Nicholson, Austin Peay State University

Ken Adcock, Cleveland State Community College

Joyce Crowell, Belmont University

Doctoral

Zhijiang Dong, Middle Tennessee State University

Glenn Wiggins, Mississippi College

Kathy Winters, University of Tennessee – Chattanooga

Jim Johnson, Bethel University

Session Chairs

Azalea

- Session I: Ken Adcock, Cleveland State Community College
- Session II: Joyce Crowell, Belmont University
- Session III: John Nicholson, Austin Peay State University
- Session IV: John Nicholson, Austin Peay State University

Dogwood I

- Session I: Melissa Wiggins, Mississippi College
- Session II: Nancy Smithfield, Austin Peay State University
- Session III: Kevin Harris, Nashville State Community College
- Session IV: Wayne Summers, Columbus State University

Dogwood II

- Session I: Jim Johnson, Bethel University
- Session II: Kathy Winters, University of Tennessee - Chattanooga
- Session III: John Stamey, Coastal Carolina University
- Session IV: Ashraful Chowdhury, Georgia Perimeter College

Magnolia

- Session I: Jim Clark, University of Tennessee - Martin
- Session II: Otha Britton, University of Tennessee - Martin
- Session III: Edward Bosworth, Columbus State University
- Session IV: Edward Bosworth, Columbus State University

Highlander

- Session I: Muhammad Ghanbari, Alabama A & M University
 - Session II: Jim Clark, University of Tennessee - Martin
 - Session III: Otha Britton, University of Tennessee - Martin
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Notes



**ACM Mid-Southeast Chapter
2010 Fall Conference
Gatlinburg, Tennessee
Glenstone Lodge**

Thursday, November 11, 2010

4:00 – 6:00 p.m.	Registration
6:00 – 7:30 p.m.	Social Meeting, Hospitality Suite
7:30 – 9:00 p.m.	Dinner — Individual Arrangements
9:00 – 11:00 p.m.	Social Gathering, Hospitality Suite

Friday, November 12, 2010

7:30 – 9:00 a.m.	Registration
7:30 – 8:00 a.m.	Morning Coffee Sponsored by Cengage Learning
8:00 – 8:10 a.m.	Welcome/Announcements — Azalea
	Welcome Chapter Chair
	Conference Announcements Conference Chair
	Program Announcements Program Chair
8:10 – 9:00 a.m.	Keynote Address
9:00 – 9:15 a.m.	Coffee Break Sponsored by Cengage Learning

Session I: 9:15 – 10:35 a.m.**Azalea: Masters Degree Presentations**

Session Chair: Ken Adcock

- 9:15 – 9:35 *Active and Passive Stereoscopic 3D Viewing Technologies*,
Jonathan G. Pitts, Alabama A&M University
- 9:35 – 9:55 *An Analysis of Unauthorized System Login Access by Using
Dynamic Kernel Patching and Live System Intrusion Attacks*,
Juan Flores, Louisiana Tech University
- 9:55 – 10:15 *Developing PeerSpace Online Collaborative Learning for CS1
and CS2 Students*, Michael Chasteen, Middle Tennessee
State University
- 10:15 – 10:35 *A Survey of Network Simulators*, Rob Dye, Tennessee
Tech University

Dogwood I: Undergraduate 4-year Presentations

Session Chair: Melissa Wiggins

- 9:15 – 9:35 *University Visualizing Graphs through Software*, Cameron
Behar, Belmont University
- 9:35 – 9:55 *MYGOPOINTS.COM – Social and Educational Service for
Children*, Paul Tesar, University of Tennessee - Martin
- 9:55 – 10:15 *Genetic Algorithms for Assessing Graph Optimality*,
Himanshu Bohra, Patrick Hearn, Richard Hodges,
Mark Plagge, and Brandon Short, Columbus State
University
- 10:15 – 10:35 *Evolution of Neural Architectures*, Jonathan Zeiger,
Samford University
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Dogwood II:**Doctoral Degree Presentations**

Session Chair: Jim Johnson

9:15 – 9:35

RRA: An Audio Format for Single-Source Music and Lyrics, Madhav Rao, University of Alabama

9:35 – 9:55

Bridging the Semantic Gap in Building Biomedical Information Systems Using Concept Maps, Varadraj P. Gurupur, University of Alabama - Birmingham

9:55 – 10:15

Grammar Inference Technology for Model Co-Evolution, Qichao Liu, University of Alabama - Birmingham

10:15 – 10:35

A Statistical Approach to Grammar Inference, Upendra Sapkota, University of Alabama - Birmingham**Magnolia:****Professional Presentations**

Session Chair: Jim Clark

9:15 – 9:35

10,000 New Computer Science Teachers by 2015 – How can we help?, Wayne Summers, Columbus State University

9:35 – 9:55

Introduction to Visual Analytics for Command, Control, and Interoperability Environments: A Special Topics Course, Jacqueline Jackson, Jackson State University

9:55 – 10:15

A PHP-based Web Frontend for a Molecular Dynamic Computational Software Package, Haifei Li, Union University

10:15 – 10:35

GUI Rather than Standard Console I/O in a Beginning C++ Course, Otha Britton, University of Tennessee – Martin**Highlander:****Professional Presentations**

Session Chair: Muhammad Ghanbari

9:15 – 9:35

An Investigation of the CS0 Boot Camp Technique on CS1 Student Performance, H. Erin Rickard, Coastal Carolina University

9:35 – 9:55

Educating the Non-Programmers, Tools for HTTP Instruction, Jeremy Ey, Tennessee Tech University

9:55 – 10:15

An Applet Package for CS0, William H. Hooper and Joyce Blair Crowell, Belmont University

10:15 – 10:35

Real-time Community Building with the Twitter API, Semmy Purewal, Georgia Gwinnett College

Session II: 10:40 – 12:00 p.m.**Azalea: Masters Degree Presentations**

Session Chair: Joyce Crowell

10:40 – 11:00 *Protecting an Evolving Infrastructure: Why We Worry About Smart Grid Cyber Security*, Summer Olmstead, Tennessee Tech University

11:00 – 11:20 *Multiplayer Browser Game Using the Greenfoot IDE*, Aristeidis Tzanis and Olamipo Femi Osibote, University of West Georgia

11:20 – 11:40 *Commercial Off-The-Shelf Software and the Uniform Commercial Code*, John McMeen, East Tennessee State University

11:40 – 12:00 *SMS and SMS Broadcast Vulnerabilities*, Joseph Stites, Tennessee Tech University

Dogwood I: Undergraduate 4-year Presentations

Session Chair: Nancy Smithfield

10:40 – 11:00 *Challenges in Building and Detecting Portable Source Code Morphers*, Rodrigo Sardinias, Columbus State University

11:00 – 11:20 *Simulation of Trilateration for Wireless Sensor Networks*, Brian Hawks and Amin K. Ali, Jackson State University

11:20 – 11:40 *Machine Consciousness and the Advent of Narcissistic Computers*, Chris Walling and Jesse Kawell, Samford University

11:40 – 12:00 *Parallel Computing of Free Distributive Lattices*, Janice Hill, Columbus State University

Dogwood II:**Doctoral Degree Presentations**

Session Chair: Kathy Winters

10:40 – 11:00

Diagnosis between Melanoma and Nevi from Images of Skin Histology Slides by using SVM Classifier, Song Gao, University of Alabama - Birmingham

11:00 – 11:20

Finding bands in optical coherence tomography images using curve and function fitting, Douglas Ross, University of Alabama - Birmingham

11:20 – 11:40

Tracking Spammers with Sender's Name and Domain name, Soma Halder, University of Alabama - Birmingham

11:40 – 12:00

Watching Black Market Internet Relay Chat (IRC) Rooms, Jason Britt, University of Alabama - Birmingham

Magnolia:**Professional Presentations**

Session Chair: Otha Britton

10:40 – 11:00

Deploying DBMS issues on Cloud Computing platforms, Muhammad Ghanbari, Alabama A&M University

11:00 – 11:20

ShopTalk: A Mobile Grocery Shopping Application for the Visually Impaired, John Nicholson, Austin Peay State University

11:20 – 11:40

For Girls Who Aren't Afraid of a Mouse: The Miss-Adventures of Nancy Drew Computer Games for Girls, Beth Walker, University of Tennessee - Martin

11:40 – 12:00

Using Alice to Promote Interest in Computer Science, Chelsea Rath and Brenda Parker, Middle Tennessee State University

Highlander:**Professional Presentations**

Session Chair: Jim Clark

10:40 – 11:00

Improving Retention of Computing Majors, Suzanne Smith and Kellie Price, East Tennessee State University

11:00 – 11:20

MapReduce: A programming model for manipulating large datasets, Srinivasarao Krishnaprasad, Jacksonville State University

11:20 – 11:40

A Report: New Virtual Lab Software, Willard Munger Ph.D. and Scot Anderson Ph.D., Southern Adventist University

11:40 – 12:00

From LEGO Robotics Summer Camp Projects to CS1 KAREL Assignments, Cen Li, Middle Tennessee State University

Lunch**Patio Restaurant 12:00 – 1:00 p.m.**

Session III **1:00 – 2:20 p.m.****Azalea:** **Masters Degree Presentations**

Session Chair: John Nicholson

- 1:00 – 1:20 *Preventing Phishing Attacks on OpenID using Personally Recognizable Information via a CAPTCHA-based Technique*, Jan Durand, Louisiana Tech University
- 1:20 – 1:40 *Protecting The Kernel: Using Integrity and Virtualization*, Ferrol Aderholdt, Tennessee Tech University
- 1:40 – 2:00 *Analyzing and Comparing Scratch Programs*, Brittany Stewart, University of Alabama at Birmingham
- 2:00 – 2:20 *Patient Privacy Protection Through Data Obfuscation and Distortion*, Robert Derveloy, University of Tennessee - Chattanooga

Dogwood I: **Undergraduate 4-year Presentations**

Session Chair: Kevin Harris

- 1:00 – 1:20 *Impact of Threshold Distance-based Route Selection on Multicast Trees for Mobile Ad hoc Networks*, Nikema Smith, Jackson State University
- 1:20 – 1:40 *Community Mapping*, Josh Moore, Samford University
- 1:40 – 2:00 *Developing and Releasing an iPhone Application*, Russell Christensen and TJ Phillips, Austin Peay State University
- 2:00 – 2:20 *Robotics to Increase Student Motivation and Interest in Computer Science*, Kyle Burton, Armstrong Atlantic State University
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Dogwood II:**Undergraduate 4-year Presentations**

Session Chair: John Stamey

1:00 – 1:20

Maps Don't Make Themselves, But You Don't Have To Either!,
Ameen Kazerouni, Cliff Padgett, and Brandon
Shrewsbury, University of West Georgia

1:20 – 1:40

*TheCave: Using GPUs and Classical Philosophy to Data-Mine
Images*, Charles Stolper, Furman University

1:40 – 2:00

Domain-Specific Languages: Making Robotics More Accessible,
Randall T. Heidorn, Indiana University Southeast

2:00 – 2:20

*The Development of a Simple and Secure Remote Protocol for the
Control of a Stepper-Motor via the Internet*, Chikwudi
Akujuobi, Jennifer Coleman, and Janise Fowler, Alabama
A&M

Magnolia:**Professional Presentations**

Session Chair: Edward Bosworth

1:00 – 1:20

*An Application of Data Mining and Neural Networks for the
Determination of Stock Trading Pairs*, Willie Bossie, Alabama
A&M University

1:20 – 1:40

*Command-line Windows Forensics Tools: Advantages,
Disadvantages and Compatibility Issues*, Lydia Ray, Columbus
State University

1:40 – 2:00

Developing and Teaching a Robotics Course, Xuejun Liang,
Jackson State University

2:00 – 2:20

*Living on the Bombing Range: The Expanding Role of Remote
Services*, Eric L. Brown and Jeremy Ey, Tennessee Tech
University

Highlander:**Professional Presentations**

Session Chair: Otha Britton

1:00 – 1:20

*Distributed Remote Sensing Image Information Mining with
DryadLINQ*, Jiang Li, Austin Peay State University

1:20 – 1:40

Sketchmate: An Instructional Tool for Splay Trees, Michael C.
Orsega, University of West Georgia

1:40 – 2:00

Graduate School in Computing: Why? When?, Phil Pfeiffer,
East Tennessee State University

2:00 – 2:20

*Experiences of Organizing Computer Science Summer Camps for
High School Students*, Zhijiang Dong, Middle Tennessee
State University

Break**Poolside 2:20 – 2:35 p.m.****Sponsored by Cengage Learning**

Session IV **2:35 – 3:55 p.m.****Azalea:** **Masters Degree and Undergraduate 2-year Presentations**

Session Chair: John Nicholson

2:35 – 2:55 *Scalable Hierarchical Image Indexing for Content Based Image Retrieval*, Rob Fletcher, University of Tennessee - Chattanooga

2:55 – 3:15 *Electric Vehicle Simulation for Google Android (EVDroid)*, Wade Gasior, Matt McNeely, and Brandon Davidoff, University of Tennessee – Chattanooga

3:15 – 3:35 *Personal Security in the Social Networking Age*, Domnic Alston, Steven Bozarth, Karen Santiago, and Joshanda Odems, Nashville State Community College

3:35 – 3:55 *T.I.M. (Taking Images of Mariana)*, Kyle Jewett, Rodney Thompson, Bernard Tidimane, William Howard, Georgia Perimeter College

Dogwood I: **Undergraduate 4-year Presentations**

Session Chair: Wayne Summers

2:35 – 2:55 *Web and Database App Development and Deployment Using ASP.net MVC*, Ian Weston and Ben Hollomon, University of Tennessee - Martin

2:55 – 3:15 *Behavior Driven Distributed Robotics Over The Web*, Gabriel Loewen and James Weston, Armstrong Atlantic State University

3:15 – 3:35 *Supporting Resilience and Application Monitoring in Large-Scale HPC Systems*, Taylor Baldwin, Coastal Carolina University

3:35 – 3:55 *Implementing Digital Democracy: An Online Democracy Education Simulation*, Mick McGrath, Middle Tennessee State University

Dogwood II:**Undergraduate 4-year Presentations**

Session Chair: Ashraful Chowdhury

2:35 – 2:55

Image Segmentation Using the Map-MRF Model and Contour Map Displacement Labels, Neva Waynesboro, Coastal Carolina University

2:55 – 3:15

Randomly Generated Edge-Disjoint Spanning Trees-based Data Gathering for Wireless Sensor Networks, Loni Taylor, Jackson State University

3:15 – 3:35

Poetry on Demand, Rodrigo Obando and Robert Smith, Columbus State University

3:35 – 3:55

Tools for an Undergraduate Software Project Course, Jack Thompson, University of Tennessee - Chattanooga**Magnolia:****Professional Presentations**

Session Chair: Edward Bosworth

2:35 – 2:55

How Do We Improve the Pass Rate in a CS1 Course? One School's Attempt, Kathy Winters, University of Tennessee - Chattanooga

2:55 – 3:15

What's so Functional About Functional Programming?, Ken R. Adcock, Jr., UPS

3:15 – 3:35

Ten Things Every Graduate Student Should Know, R. Phillip Bording, Alabama A&M University

3:35 – 3:55

Creating iPhone Apps With C# Using Novel's MonoTouch, Bob Bradley, University of Tennessee – Martin**5:00 – 5:30 p.m.****Business Meeting, Magnolia****5:30 – 7:00 p.m.****Social Gathering, Hospitality Suite****7:00 – 8:30 p.m.****Awards Banquet, Azalea****8:30 – 11:00 p.m.****Social Gathering, Hospitality Suite**

Notes



Keynote Address

Dr. Mark Ciampa

Assistant Professor

Western Kentucky University

Phishing: Protecting Users Through Behavior Influencing Security Policies

Abstract

Computer security remains a fundamental problem for computer users and organizations. One of the most common types of attacks is “phishing,” which is the act of tricking the user into divulging confidential information. Different strategies have been proposed to protect users from phishing. These include eliminating the threat, warning users about the threat, and training users to not provide confidential information. Each of these strategies has proven to be marginally effective. Some organizations are now using written security policies to influence user behavior in defending against phishing attacks. In this talk, we will discuss computer security: how we got to where we are today, phishing attacks and defenses, ineffectiveness of types of user training, how security policies play a role in organizations today, and various content elements of security policies and their effect on mitigating phishing attacks.

About the Speaker

Mark Ciampa is an Assistant Professor of Computer Information Systems at Western Kentucky University in Bowling Green, Kentucky and holds a PhD in Digital Communication Systems from Indiana State University. Prior to this he was an Associate Professor and served as the Director of Academic Computing at Volunteer State Community College in Gallatin, Tennessee for 20 years. Mark has worked in the IT industry as a computer consultant for the U.S. Postal Service, the Tennessee Municipal Technical Advisory Service, and the University of Tennessee. He is also the author of 19 technology textbooks, including *Security+ Guide to Network Security Fundamentals 3ed*, *CWNA Guide to Wireless LANs 2ed*, *Guide to Wireless Communications*, *Security Awareness: Applying Practical Security In Your World*, and *Networking BASICS*.

Student Abstracts
Undergraduate Two-Year Programs

Personal Security in the Social Networking Age

Domnic Alston, Steven Bozarth, Karen Santiago, and
Joshanda Odems

Nashville State Community College

In this social networking age, the risk of personal intrusion is more than significant than ever. Facebook, YouTube, Craigslist and Wikipedia, as well as Web services such as eBay and Gmail, enable self-publishing and high interaction between users via blogs and RSS feeds. This allows for hackers or anyone with remedial computers skills to attack a user or corporation with malware, spyware, key-loggers, or viruses.

Furthermore, this allows for crimes including identity theft, fraud, and stalking. It is all too easy to falsely represent yourself as something other than whom or what you truly are. Is that “friend” who claims to be a twenty year old college student really who he or she says they are? How can you be sure they’re not a twelve year old sneaking on to her parents’ computer? How can parents be sure that their children’s “friends” are not the neighborhood pedophile? This paper will explore security issues as well as ways to improve your own personal security when using such sites. We will also explore some of the more recent news items concerning problematic misuse of such including that led tragically to death. Finally we will discuss ways to keep your risk to a minimum while still using such sites for the benefits they can convey such as help in networking for job searches.

T.I.M. (Taking Images of Mariana)

Kyle Jewett, Rodney Thompson, Bernard Tidimane,
and William Howard

Advisor: Dr. Anant Honkan

Georgia Perimeter College

If the human body is comprised of about 71% water, why then is almost 95% of the oceans almost completely unexplored with 20% of them having no known data at all (Unexplored ocean figures taken from “The Census for Marine Life”)? This is the question we asked ourselves as our project to find the unknown began. The expense of getting to the deep seemed too large for most to undertake. Our goal was to reduce the expense and to set a budget of approximately two to three thousand dollars with the hopes of placing T.I.M., our submersible, into the deepest part of the ocean within 5 years to fulfill his name, Take Images of Mariana.

A club of thirty plus members began scouring the internet, speaking to professors, asking experts in appropriate fields and performing the necessary calculations needed to even attempt that kind of depth. Multiple prototypes were made of various shapes and preliminary testing was undertaken in the deepest swimming pools we could find. After the best size and shape decided glass was selected as one of the components. This lead into camera research, lighting and a new understanding of the lumen output of various LED lights. Our pool tests allowed us to map the optimal 2-3 feet camera and light combination we needed to capture sharp images at relatively large depths. We learned that by taking multiple sheets of plexiglass, cutting them to size, melting them together and polishing the ends, we had an inexpensive way to shine lights through the end of the submersible without having to reinforce the light itself. This helped for our camera and battery issues as well.

In less than one year we already began testing materials needed for various parts. Thru this project we see the principles and problems solving skills learned in Physics (circuit wiring) mathematics (multiple computations), engineering graphics and design (modeling, material design, various types of analysis) and basic engineering (design process by step by step, top down strategy) and programming skills to this project. We understand that the Mariana Trench is still a long ways off, but this is the first step toward that lofty goal. When completed, we hope to market this project to research institutions as an extremely low cost way to discover the oceans, and in the process become professionals in our respective engineering fields.

Notes



Student Abstracts
Undergraduate Four-Year Programs

Visualizing Graphs through Software

Cameron Behar

Belmont University

For years, graph theorists have been confined to pencil, paper, and their imaginations alone when it came to visualizing and communicating their ideas. However, with the advent of the technological era, new tools have become available, allowing theorists to quickly generate, manipulate, and evaluate different drawings of graphs with relative ease. Furthermore, such tedious and error-prone calculations as counting crossings have been delegated to computers, minimizing both time spent on simple, repetitive computation and the likelihood of error. Even today, such software is being used to verify previously intractable solutions and generate complex data sets that might otherwise take thousands of man-hours to evaluate.

This presentation will introduce VisiGraph, one such open-source tool developed by senior Belmont University student Cameron Behar under the supervision of resident graph theorist Dr. Glenn Acree. In addition to a demonstration of its use, the presentation will also document the evolution of the program's development up to the present, and examine some of the more unique problems and solutions that arose during its most recent re-design, re-implementation, and significant expansion in Java.

MYGOPOINTS.COM – Social and Educational Service for Children

Paul Tesar

Advisor: Bob Bradley

Univ of Tennessee - Martin

Social websites are some of the fastest growing entities on today's Internet. Teenagers and adults quickly learned to use social websites as their primary tool to communicate with their friends and families. At first, young children were left out because they did not have access to the Internet and/or skills to use any offered service. That however is no longer the truth as the Internet became available to nearly anyone, and children are now being exposed to social websites through their families or friends at school.

The new trend of young children accessing social websites brought up a concern that they could be in danger as the majority of sites are not safe enough for young users. This concern generated a demand for an alternative child friendly service with a safe controlled environment that was designed specifically for young children. Such service ought to be maintained by a public organization that would have the responsibility of keeping children safe.

In the spring of 2010, our group was awarded a national PBS Kids Go grant (through the local PBS station) to develop a new social web site for young children in elementary schools.

One of the major goals for the PBS project was to provide a social website that lets children in elementary schools engage in social networking activities that were fun, educational and most importantly safe. The first step was to make the website available to the local PBS station and children in local community. As the website was highly scalable, the second step was to let other PBS stations across the nation become part of the system.

The system was built upon the Friendito Social Framework (developed by Paul Tesar), which provided a highly customizable module based structure that delivered desired functionality for this project. With the foundation of Friendito Social Framework, our group utilized both agile and rapid application development techniques. The system is primarily coded in PHP and MySQL, and is enhanced by Ajax, JavaScript and Flash. The results of our efforts will be discussed in this talk.

Genetic Algorithms for Assessing Graph Optimality

Himanshu Bohra, Patrick Hearn, Richard Hodges, Mark Plagge, and Brandon Short

Columbus State University

Many problems arising in the study of computer science are well modeled by mathematical graphs. We use the term “ (n, m) -graph” to denote a graph on n vertices with m edges. One use of graph theory is to address specific important network reliability problems. These problems are translated easily into problems of optimizing a selected measure on an (n, m) -graph. The most common optimization problems specify both the edge count and vertex count of the graph.

There are several open graph optimization problems that are not yet susceptible to theoretical analysis, which is the preferred way to approach such problems. This project describes the use of genetic algorithms to generate a large number of candidate graphs which can then be assessed for optimality under any computable measure. The goal of this project is to suggest certain candidate graphs for further theoretical analysis.

In the genetic algorithm approach, each of a set of candidate solutions is assessed for optimality. Some of these candidates are retained and new candidate solutions are generated using pseudo-random methods. When applied to graph optimality problems, we thought it best to work with the adjacency matrix representation of the graph.

The first part of this paper describes the approach to storing the adjacency matrix of a simple graph, which can be either directed or undirected. We then focus on undirected graphs and present a data structure that guarantees that any graph produced by the genetic operators will remain a valid (n, m) -graph.

Evolution of Neural Architectures

Jonathan Zeiger

Advisor: Dr. Steve Donaldson

Samford University

Humans possess formidable neural systems capable of solving certain types of problems in a fashion that far outstrips modern computer systems. However, very little is known about how evolution has driven the development of such complex neural architectures. Our goal is to better understand the environmental constraints that lead to the creation of neural circuits capable of performing useful tasks and to explore how those circuits can be employed as building blocks in networks of increasing sophistication. To that end, we have created a genomic encoding system that succinctly but flexibly represents the pertinent information required to designate neural network architectures and have developed a genetic algorithm for simulating evolution of such architectures. Selection in the genetic algorithm is implemented via integration with a separately developed neural network simulation component that produces and tests a phenotypic model of the evolved genotype.



Challenges in Building and Detecting Portable Source Code Morphers

Rodrigo Sardinias

Columbus State University

Metamorphism is the ability of malware to transform its code. Walenstein et al. mention that metamorphic malware can transform itself in one of two ways; it can either transform the binary representation of itself, or it can carry a higher representation of the code and use that to transform itself. This research deals with the latter. The first virus to do this was Win32.Apparition and appeared in 2000. It carried a copy of its source code and would infect computers that had suitable compilers.

We will be making a small metamorphic c++ program that does this very same thing without exhibiting malicious behavior. Just as it is no easy task detecting this type of malware, neither is it an easy task making a truly metamorphic program. Some parts of the task will be easier than others, and there is always something that can be done differently, however, there is usually some constant whose presence is necessary in order to make the program metamorphic. In the case of the latter, this could prove to be a way to detect metamorphic malware.

Due to security concerns this program does not implement any kind of directory search to find a compiler or any kind of network search to find receptive computers. The address of the compiler and target computer are written into the code. Some of the commands used in our program currently make it specific to the windows platform.

Simulation of Trilateration for Wireless Sensor Networks

Amin K. Ali

NSF CISE REU Program
Jackson State University

It could be highly crucial to know the location of the nodes in a wireless sensor network to accurately process and interpret the data sensed. In this research, we explore the use of trilateration to determine node locations in a wireless sensor network. The trilateration technique requires only a small fraction of the nodes in the network (referred to as landmark nodes) to be equipped with expensive and energy-draining GPS units. The algorithm proceeds in iterations wherein we first estimate the locations of nodes in the neighborhood of at least three landmark nodes. In the subsequent iterations, we use these approximated locations (of the regular sensor nodes) along with the locations of the landmark nodes to predict the locations that are not yet known. In order to mimic reality, we introduced a “margin of error” in estimating the distance between two nodes using the strength of the beacon signal received at a node. For a given network dimension and number of nodes, the trilateration simulations were conducted with three parameters – number of landmark nodes, the transmission range per node and margin of error. We noticed that if the margin of error (incremented in units of 0.25%) grows beyond 3%, the error in approximating the locations of the nodes can increase significantly (as large as by 300%). We also noticed that the transmission range per node and the number of landmark nodes are highly correlated and determine the connectivity of the network. The larger the transmission range per node, the fewer the number of landmark nodes that were required to approximate the location of every node in the network.

The above research was conducted as part of the NSF-sponsored Research Experiences for Undergraduates (REU) program at Jackson State University during Summer 2010, mentored by Dr. Gordon Skelton and Dr. Natarajan Meghanathan.

Machine Consciousness and the Advent of Narcissistic Computers

Chris Walling and Jesse Kawell

Faculty Advisor: Dr. Steve Donaldson

Samford University

What if a computer could say, “This is me...,” and know what that means? Recognizing that self-awareness is a complicated subject that can be approached from a variety of perspectives, we have focused on several characteristics of self-awareness observed in humans and have created a system that exhibits those features. We contend that this system constitutes a version of the “mirror test”—a psychological evaluation of self-awareness. Many animals do not pass this test, but our system does. Specifically, we have focused on creating a machine version of self-awareness in which one computer is able to distinguish itself from other entities of the same type based solely on visual input and an ability to correlate physical behavior with external sensory feedback. Because there appears to be a significant difference in programmed versus learned self-awareness, we require that our system learn to make the necessary correlation. At the same time it is performing this task it is also learning how to recognize itself based on a unique attribute that should permit it to perform the self-recognition task faster in subsequent attempts. After learning has occurred, the system can also detect when it is being forced to do something that it did not intend and will even attempt to correct itself after a forced action. We suggest that these are basic components of self-awareness and form a foundation on which more advanced characteristics of machine consciousness can be constructed.

Parallel Computing of Free Distributive Lattices

Janice Hill

Columbus State University

In 1897, Richard Dedekind asked how many monotone boolean functions existed for a particular number of variables. The sequence of numbers he discovered, $\{2, 3, 6, 20, \dots\}$, would later be named the Dedekind numbers. The Dedekind number of $M(n)$ counts the number of monotone boolean functions of n variables. Dedekind discovered that these numbers were related to the nodes of a free distributive lattice of n generators. While there is an algorithm for finding the next lattice, it is time consuming and difficult to get from one free distributive lattice to the next free distributive lattice in a sequence. In 2010, research began at Columbus State University to use Wolfram Mathematica 7 to parallelize the algorithm for finding the next free distributive lattice in a series. Mathematica 7 has the capabilities of parallelizing computations over multiple cores. This can be accomplished either on a single multicore machine or multiple machines connected via a network. By harnessing the power of today's multicore technology, it will allow for computing more complex functions at a faster rate. Therefore, using this technology will allow for solving for the next free distributive lattice to be done more quickly and efficiently, and allow for larger free distributive lattices to be computed. While Mathematica 7 makes running parallel operations feasible, the algorithm for finding the next free distributive lattice does not parallelize easily. The algorithm for finding this lattice is not balanced, meaning one core is consistently performing more calculations than the other cores. The algorithm for finding the next free distributive lattice will need to be redefined so that the algorithm is balanced and is able to be parallelized efficiently. Once the free distributive lattices are calculated, they can be built and examined in Mathematica 7 allowing for further research involving monotone boolean functions.

Impact of Threshold Distance-based Route Selection on Multicast Trees for Mobile Ad hoc Networks

Nikema Smith

NSF CISE REU Program
Jackson State University

Performance simulation studies on multicast routing protocols for mobile ad hoc networks (MANETs) have been traditionally conducted assuming the availability of any link whose physical Euclidean length (i.e., distance between the two constituent end nodes of the link) is within the transmission range per node. Networks constructed based on the above unit disk graph model are however prone to the broadcast storm problem, leading to frequent message collisions and congestion. Several broadcast optimization strategies have been proposed for MANETs; however, most of them have been studied only for unicast routing in MANETs. In this research, we study the impact of a threshold distance-based broadcast optimization strategy on the quality of shortest path (minimum hop) multicast trees. The threshold distance-based network model works as follows: there exists a link between two nodes only if the physical Euclidean length d is greater than a threshold distance D , but less than or equal to the transmission range R per node (i.e., $D \leq d \leq R$). We run the Breadth First Search algorithm on such a threshold distance-based network graph and determine a multicast tree that connects a source node to a set of receivers. The multicast tree is considered to exist as long as all links in the tree exist. Upon the failure of a link (and hence the tree), we determine a new multicast tree. The above procedure is repeated for the entire simulation time. We compare the average lifetime, hop count per source-receiver path and the number of links per tree under this threshold distance-based model with that of multicast trees determined under the unit disk graph model.

The above research was conducted as part of the NSF-sponsored Research Experiences for Undergraduates (REU) program at Jackson State University during Summer 2010, mentored by Dr. Natarajan Meghanathan and Dr. Marvin Watts.

Community Mapping

Josh Moore
 Faculty Advisor: Dr. Brian Toone
 Samford University

Our project provides an easy-to-use web application that empowers local groups to effect positive community transformation by measuring and visualizing the health of a community. Our multi-faceted approach has led to the development of three websites: one for visualizing statistics (mapmycity.org), another for mobilizing volunteers (servemycity.org), and a third website for managing the allocation of resources (resourcemycity.org).

Mapmycity.org uses two different types of visualizations to display community health statistics. Markers designate the spot location of positive resources as well as that of negative influences such as the location of abandoned houses. Our second visualization is the display of color-coded heat maps summarizing data for a particular region based on the aggregate value of the data for that region. We have matched our heat maps to the region boundaries used by the Census Bureau. Both of these types of visualizations are shown in Figure 1.

Servemycity.org connects community needs with volunteers willing to serve the community. We do this by collecting survey data for an organization that identifies specific skills of their volunteers. Then we match those skills with the service projects that have been entered into the website. The service projects are displayed on our visualizations available in mapmycity.org.

Resourcemycity.org will facilitate charitable donations and route the donations to areas of greatest need. Donations can be time/money or in-kind. This portion of the project is still under development.

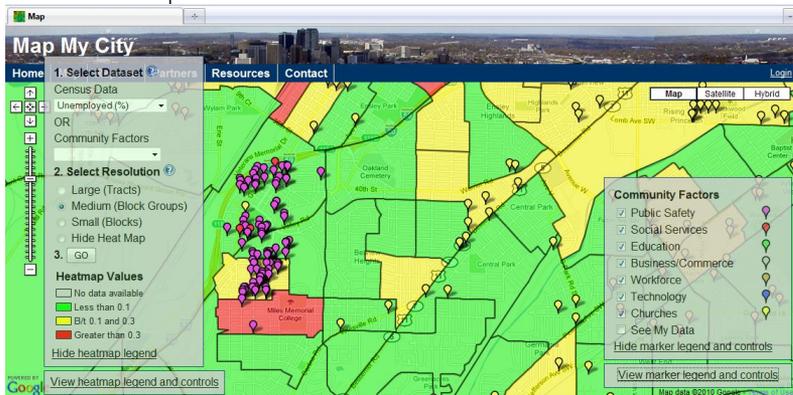


Figure 1. Marker and heat map visualizations of community health.

Developing and Releasing an iPhone Application

Russell Christensen and TJ Phillips

Austin Peay State University

Ever since the successful launch of the iPhone by Apple in 2007, the iPhone and downloadable iPhone applications (better known as apps) have become increasingly more popular. More and more college students own an iPhone and use them in their everyday lives. With such a powerful, popular, and easily accessible marketing tool literally at one's fingertips, it would make sense for higher education institutions to utilize iPhone apps for their students.

This presentation will cover the rationale for creating a university iPhone app and the difficulties encountered including iPhone limitations, the functional requirements, programming problems and solutions. The presenters will discuss the process of receiving approval of the app from the App Store and future work in the mobile technology industry. This presentation will give a brief demo of the Austin Peay State University iPhone app that was released in August 2010.

Using Robotics to Increase Student Motivation and Interest in Computer Science

Kyle Burton

Advisor: Dr. Ashraf Saad

Armstrong Atlantic University

We present a proposal for a turnkey, low maintenance curriculum for introductory computer science education centered around Ridgesoft's Intellibrain-Bot platform. The proposal focuses on encouraging more undergraduate students to enroll in additional computer science courses, as well as increase the motivation of current computer science majors to continue their studies in the field of computing. The ultimate goal is to increase the number of computer science majors by piquing their interest in the field early on and inspiring more students to eventually graduate with a degree in computer science. The proposal is centered around using the Intellibrain-Bot robot as a tool to teach core Java programming concepts. The classroom environment is workshop driven, unlike the traditional lecture based courses, where students program the robots to complete certain tasks. This presentation describes the environment in which these students worked during the first time the course was offered in Fall 2009 and the current run of the course in Fall 2010 and discusses both the rewards and challenges met during both these experiences.

Maps Don't Make Themselves, But You Don't Have To Either!

Ameen Kazerouni, Cliff Padgett, and Brandon Shrewsbury

University of West Georgia

Mapping uncharted and dynamic environments by a single entity can be a cumbersome process due to the nuances and unpredictability of the task. The aim of this project is to develop an autonomous system that encompasses a multi-agent swarm capable of mapping an unexplored area and calculating effective navigable routes. This complex task can be implemented using relatively simple semi-autonomous cooperative robotic agents with a central data hub acting as an intelligent arbiter to relay environmental information. Our system consists of Lego® NXT microcontrollers operating as semi-autonomous drones and a custom application, utilizing the RoboRealm® API, that serves as the arbiter.

As the drones begin to explore an environment, they independently collect data and relay this information to the arbiter. The arbiter compiles this navigational data into an internal map that is further optimized as exploration advances. Once exploration has commenced, the arbiter pushes optimized data to the drones. In turn, drones can use this information to perform various tasks, collect additional data for further optimization, or supply the information for use by a third party. We have developed this system for application in an educational setting as a basic way to demonstrate a cooperative multi-agent machine-learning environment.

This project may be adapted to a number of fields including defense, search and rescue, and scientific exploration. Defense applications include comparing alternative means of exploring urban and close-quarter environments; unmanned drones might map dangerous areas for ingress and egress, determine locations of enemy combatants, and suggest effective combat strategies. Search and rescue applications include locating casualties after structure collapse and exploring unstable areas to aid in recovery; geological disaster response could benefit from rapid remapping of the terrain. Slow and hazardous scientific exploration activities, such as mapping the sea floor, could be improved dramatically.

TheCave: Using GPUs and Classical Philosophy to Data-Mine Images

Charles Stolper

Furman University

In his Republic, Plato's Cave Allegory describes how all instances of an object merely share the properties of an 'ideal form' of that object. In 1980, Marr and Hildreth theorized a 'Raw Primal Sketch' which similarly argued that there are features (specifically edge-shapes) common to all instances of an object. Furthermore, data-mining of images is crucial to numerous applications and a large subset of these applications require determining first what the contents of the image are before any interpretation can take place. TheCave is a hardware/software architecture for both defining and storing a library of these 'ideal forms', as well as utilizing this library in order to identify the content of an image in order to facilitate data-mining of the image.

The library is stored as a collection of recursively-defined Form objects. Each Form is collection of Hint objects defining the Form (such as its edge shape or its color) as well as a Grammar object. This Grammar object stores the Forms that make up the Form (for example: the stem, body, and leaf of an apple) as well as Hint objects defining how the subforms relate to each other and to the superform.

TheCave consists of two interacting systems: training and execution, switching between the two on-the-fly by utilizing Gamma et al.'s strategy pattern. The former uses human-guided segmentation and definition to add or modify the Forms and Hints in the library, honing in on the 'ideal'. The latter utilizes a GPU-based parallelized 5-dimensional (RGBXY) k-means segmentation algorithm to segment the image, isolating each form. The system then determines the form of each segment by checking against each Form, determining whether or not the tests associated with each Hint of the Form apply. Finally, whenever possible, TheCave merges these basic forms into more advanced forms using the Grammar objects.

Domain-Specific Languages: Making Robotics More Accessible

Randall T. Heidorn

Indiana University Southeast

Traditionally, robotics research has incorporated ideas and methods from engineering and artificial intelligence. However, researchers are increasingly drawing on the fields of psychology and cognitive science when designing and deploying robotic systems. The increasing influence of these fields has led researchers and practitioners to revisit the current generation of development tools. In this research we investigate the use of domain-specific languages to develop robotics software. The use of domain-specific languages, or DSLs, will lower the barrier to entry into the field of robotics by allowing users without training in traditional programming to develop robotics software.

The Development of a Simple and Secure Remote Protocol for the Control of a Stepper-Motor via the Internet

Chikwudi Akujuobi, Jennifer Coleman, and Janise Fowler

Alabama A&M University

Stepper-motor are electro-mechanical devices that are widely used in factories, manufacturing facilities, and consumer end products. With the increasing use of the Internet as a means of controlling a variety of electro-mechanical devices, there is an increasing need to develop simple and secure means of transmitting and receiving data from these devices. A simple secure protocol is proposed that will allow a user to control a stepper-motor that is connected in a networked client/server configuration via the Internet. Encrypted control data will be encoded into a customized packet and delivered between the user client/server computers by using the User Datagram Protocol, one of the core members of the Internet Protocol Suite. Once the packet is received, it will be decrypted and the control data sent to the stepper-motor. The stepper-motor is connected to a wireless remote client computer by using a Phidget controller board. The encryption and decryption software, the custom packet protocol, and the user server and remote client software were all written using the C# programming language.

Web and Database App Development and Deployment Using ASP.net MVC

Ian Weston and Ben Hollomon

Advisor: Bob Bradley

University of Tennessee - Martin

This talk will focus on the development and deployment of an ASP.net MVC web application to replace an old DOS program for the Gibson County Emergency Operations Center. The program is required to maintain a fire subscription database as well as maintain and log wrecker services for the Gibson County area. We'll explore the ASP.net MVC framework, MySQL database and other technologies used such as JQuery to provide quick development and a rich user experience. The project timeline, collaborative project management, customer/developer relationship and installation will be highlighted in this journey from gathering requirements to project deployment.

This is a continuation of last years talk. Last year the project was in the early development stages. This year, the system has been deployed and is being used. If time permits, we will also talk about the development system setup (virtual machines and servers).

Behavior Driven Distributed Robotics Over The Web

Gabriel Loewen and James Weston

Advisor: Dr. Ashraf Saad

Armstrong Atlantic State University

We present a platform for controlling and monitoring a distributed set of robots over the web by taking advantage of user-defined behaviors. The platform is composed three distinct systems and can accommodate many users. A workstation is set up within Bluetooth range of the robots and is responsible for wirelessly transferring data to and from the robots as well as receive commands from the user. There is a remote database which sits in between the host computer and the user. An overhead camera offers continuous video streaming of the robots. The user is able to interact with the robots by selecting a behavior and issuing commands which are stored in the database intermediately. The host machine periodically checks the database for new commands and transmits them to the robots appropriately. Because the behaviors are user-defined and are implemented using a Java interface, or template, the system is easily expanded upon. In addition, there is a layer of abstraction between the user and the system such that the development of behaviors can be accomplished without any knowledge of how each robot operates. Each robot has attached sensors which allow it to move along black grid lines. At each intersection point of the grid each robot stops and transmits data regarding the possible next moves it may take. For example, if the robot comes to an intersection and does not detect a line using its right line sensor it will transmit data notifying the host computer that a right turn is not possible. Based on the set of possible moves determined by the robots each behavior must use an adaptive algorithm to allow for the possibility of a dynamically changing environment. Some of the interesting possibilities with using this system include path driven navigation, swarm robotics, and automatic maze solving.

Supporting Resilience and Application Monitoring in Large-Scale HPC Systems

Taylor Baldwin

Coastal Carolina University

Due to incompatibility between layers in a typical HPC software stack and the heterogeneity among such stacks for disparate systems, reporting of return codes, signals, and other valuable error-diagnosing information are often not reported or available to the end user, or in some cases to system administrators. In order to quickly determine which pieces of this information are reported for a given system, we have developed a Failure Test Harness (FTH) that can be used to correlate synthetically generated application errors with the data autonomously gathered using HPC application monitoring software. This module can be integrated with resilience software by providing the necessary triggers to observe application state and attempt to improve application throughput. In this paper, we describe the design and implementation of the FTH and discuss how this system can be integrated with existing software stacks in HPC systems.

Implementing Digital Democracy: An Online Democracy Education Simulation

Mick McGrath

Middle Tennessee State University

The Digital Democracy system is an online application that allows a group of students to each assume the role of an important political figure and simulate the creation of policies and the making of decisions in our Democratic society.

The system was built with three primary tools: PHP, MySQL, and jQuery. PHP and MySQL allow the system to store information and retrieve it when necessary, and jQuery made rapid development and manipulation of a detailed graphical user interface a possibility.

The system's user interface is loosely based on that of the iPhone and Android mobile operating systems. Users navigate through the system via large, visually pleasing buttons and animated, sliding tabs.

The directory structure of the Digital Democracy system is important. It was designed with extensibility in mind and is very closely related to the different tabs, pages, and options of the user interface; each new folder in the file system creates a new tab option in the user interface. Because of this method, new features can be added by simply dropping in new folders or files rather than making changes to the system itself.

The true power of the system, however, lies in the administrator's "Edit Page" tab. From this page, administrators are able to simply "drag-n-drop" desired elements onto their page. Elements, which include things like images and text, can be added, moved, resized, changed, or deleted in an intuitive manner to easily create unique pages. Because of this, a software developer is not required when new content needs to be added.

Using the Digital Democracy system, instructors are able to rapidly produce storylines and democratic situations that can provide a fun, interactive, and possibly adaptive environment in which students can learn about our country's legislative techniques and procedures.

Image Segmentation Using the Map-MRF Model and Contour Map Displacement Labels

Neva Waynesboro

Coastal Carolina University

The analysis of medical images, such as CT scans, provides numerous algorithmic and computational challenges. This paper describes an approach for image segmentation of the heart in coronal non-contrast CT images using a knowledge driven Map-MRF model. This technique takes a shape prior probability distribution and performs a novel characterization of the segmentation problem. Traditionally, a set of image sites are mapped to a set of labels for improving image analysis. Prior work has shown that correlating pixel/label pairs to the desired set of objects allows these objects of interest to be isolated from the background with a mask. This approach expands on this previous work with the insight that image sites can be mapped to locations on a contour map, where the labels represent local displacements of the contour. This paper describes the application of Map-MRF theory and the results of the contour map labeling approach.

Randomly Generated Edge-Disjoint Spanning Trees-based Data Gathering for Wireless Sensor Networks

Loni Taylor

NSF CISE REU Program
Jackson State University

The high-level objective of this research is to explore the use of k -edge disjoint spanning trees for data gathering in wireless sensor networks. Our algorithm to determine the k -edge disjoint spanning trees is as follows: We first create a sorted sequence of edges based on their transmission-reception energy loss that is a function of the distance between the constituent nodes of the edge. We randomly shuffle the sorted sequence of edges. We construct a spanning tree based on this shuffled sequence of edges. We remove the edges that are in the previously generated spanning tree(s) and obtain a reduced graph. We repeat the above procedure on the reduced graph and generate spanning trees until no more spanning tree can be generated or k -edge disjoint spanning trees are generated. The internal nodes of a spanning tree form a Connected Dominating Set (CDS). We select the root node to be the node with the highest energy among the nodes in the CDS. The data gathering (DG) tree comprises of links that form the rooted directed tree among the CDS nodes and the links from the leaf nodes to their nearest CDS node. We repeat the data gathering process for every T rounds (k and T are input parameters for our algorithm) and then switch to the next edge disjoint spanning tree in the k -tree list. Through extensive simulations, we studied the pros and cons on the use of k -edge disjoint spanning trees by comparing their performance with that of a minimum spanning tree (MST)-based DG tree whose root node is the highest-energy node selected for every round of data gathering.

The above research was conducted as part of the NSF-sponsored Research Experiences for Undergraduates (REU) program at Jackson State University during Summer 2010, mentored by Dr. Natarajan Meghanathan and Dr. Xuejun Liang.

Poetry on Demand

Rodrigo Obando and Robert Smith

Columbus State University

What happens when you take one of the most popular mobile platforms on the market and turn it into a poetry distribution platform? In spring semester 2010, work began at Columbus State University on a project that would provide such a service. The project would make it possible for students to publish their poetry through the university's English department, and it would also provide published poets (students and non-students) a means of distributing their poetry. It would also provide enthusiasts a way to browse these works through Apple's iPhone and iPod Touch devices. This presentation will discuss the original project's design in terms of the creation and use of a Microsoft SQL Server 2008 database to store both poet and poem data, a web service built with Microsoft's ASP.NET to handle SOAP requests for this data, an iPhone poetry browsing application that would access this web service using the SOAP protocol, and the utilization of the iPhone's native SQLite-based persistent storage to store 'favorites.' This presentation will also discuss how the goals and implementation of the project have evolved since its initial completion at the end of spring semester 2010, when the focus of the project shifted from a poetry distribution service that was dedicated to providing access to only published and student poetry to a poetry publishing service that accepts only unpublished works, is open to the public, and that will work equally well on Apple's newest platform: the iPad.

Tools for an Undergraduate Software Project Course

Jack Thompson

University of Tennessee - Chattanooga

All computer science majors at UTC are required to complete a year-long team software development project. The project is initiated when students enroll in CPSC 4900: Software Engineering, during the fall semester of their senior year. It is continued into the spring semester in CPSC 4910: Senior Capstone Project. One of the difficulties we experienced in implementing this sequence has been the selection of an appropriate software development process model and the acquisition of a suite of useful and productive tools that could be easily learned and productively employed by students. For the last two years I have taught this sequence using the Extreme Programming (XP) software development model and Microsoft's Visual Studio Team System support tools. I am continuing their use in this year's courses. The purpose of this presentation will be to relate my experiences with this approach.

Notes



Student Abstracts
Master's Degree Programs

Active and Passive Stereoscopic 3D Viewing Technologies

Jonathan G. Pitts

Alabama A&M University

Three Dimensional Imagery both in still images and movies continues to grow and develop as the premier way to present both informational data and entertainment. Within the formats for three dimensional display are two major ways to give viewers a 3D feel on 2D monitors and displays. Within passive 3D viewing; Anaglyph technology is the concept of displaying images utilizing a color system (generally red and blue) to give viewers an image that seems to lift off of the screen thus giving a 3D experience. The use of red and blue (or red and green) lens glasses allow for the eye with the red lens to see the red sections of the picture with the same filtering concept applying to the blue/green filtered eye thus allowing both eyes to see just the perspective that they are supposed to see for the 3D effect. Within active 3D viewing; liquid crystal shutter glasses use alternate frame sequencing for differing display perspectives to make the eyes of the viewers believe that objects are further or closer than they are in reality. The glasses are controlled by an infrared, radio frequency, DLP-Link or Bluetooth transmitter that sends a timing signal that allows the glasses to alternately darken over one eye, and then the other, in synchronization with the refresh rate of the screen. A comparison of these technologies can give both the advantages and disadvantages of both approaches while also opening the opportunity to find other possibilities for future improvements to current 3D technology.

An Analysis of Unauthorized System Login Access by Using Dynamic Kernel Patching and Live System Intrusion Attacks

Juan Flores

Advisor: Dr. Travis Atkison

Louisiana Tech University

Traditionally, passwords have been the first line of defense against unauthorized access to a computer operating system. Windows and Linux depend on this type of authentication system to provide end-users access to their data. Although, this type of authentication system suffers from many different weaknesses, end-users keep relying on it to secure their personal files and applications. Guidelines to create better and more secure passwords have been written; however, they give a false sense of security to the end-user. Although a good password can be effective to protect users from unauthorized remote access, they provide little or no protection against physical access when not used correctly. Because of the way Windows and Linux systems depend on user names and passwords as the ultimate protection for personal data by default, they are vulnerable to several physical access attacks. Attacks such as live system intrusion and dynamic kernel patching are so efficient that the attacker does not need to know or break any user passwords to get access to the system itself or files. Because of this, end-users should not rely on their user password to protect their private information in Windows or Linux unless they use other type of protection such as encryption. This presentation will show why Windows and Linux systems are vulnerable to some of these physical attacks. This will be further emphasized by demonstration of a physical attack to gain access to the desktop environment of one of these operating systems. Workarounds that will allow a user to prevent some of these physical attacks from being successful will also be presented.

Developing PeerSpace Online Collaborative Learning for CS1 and CS2 Students

Michael Chasteen

Middle Tennessee State University

Studies have revealed an unfortunate culture among students in introductory computer science (CS) courses that are characterized by: combativeness towards the opinions of peers, unwillingness to support or aid others, disdain for working in groups, and a lack of motivation, persistence. As a result, high dropout and failure rates, sometimes as high as fifty percent, have been a common phenomenon in introductory CS courses (i.e. CS1 and CS2) nationwide. The goal of PeerSpace is to promote peer collaborative learning in introductory CS courses by providing carefully designed peer collaborative exercises within a friendly, peer-supportive online social network environment, and to facilitate the building of peer support networks that lasts beyond the introductory CS courses.

PeerSpace is mainly developed based on the Elgg social engine. It provides tools, such as discussion forum, blogs, and online chats that facilitate social interaction among the students. Students are encouraged to participate in this community where contribution to the community is kept.

Aside from social components, a number of tools have been developed to promote learning of course material. Preparation Station is a tool for students to review course concepts and get immediate feedback on their answers as well as explanations to the answers. This tool has been used for chapter reviews and test preparation purposes. An assignment repository module exists to allow students to submit their projects and view the graded assignments electronically.

In addition, student groups have been created for individual classes. Within each class, study groups of 5-6 students are created. Group learning activities are assigned throughout the semester to allow the students to interact within the smaller study groups. Students are also required to work on weekly group homework in the form of wiki pages. There is also an instant messenger service which allows students to communicate privately and in groups.

A Survey of Network Simulators

Rob Dye

Tennessee Tech University

Several open source and commercial network simulation environments are available today. However, many of the best commercial tools are prohibitively expensive for students actively involved in academic research that has little or no funding. A number of free tools exists and each of these tools has its own strengths and weaknesses that influence its applicability to a particular research project. Unfortunately, many of the available tools are difficult to use due to very high learning curves and are typically not well documented. The time needed to learn how to use these tools can be greater than the time available to an undergraduate student working on a single-semester class project or even the Master's student who has only a year or two to complete a thesis. Furthermore, most of the projects require the user who isn't using pre-built binaries for a specific OS to compile from source, and the build process is often complex and its dependencies are poorly documented. Once compiled, the lack of documentation and quick start guides often leaves the student wondering if the tool can accomplish all of the desired tasks and if so, how to begin accomplishing those tasks.

In this presentation, we discuss several free network simulation environments, including cnet, GTNetS, NS-2, NS-3, and Omnett++, in terms of how complete their documentation is, how easy they are to compile and run, how rich their feature set is, and how user-friendly they are for a beginner.

Protecting an Evolving Infrastructure: Why We Worry About Smart Grid Cyber Security

Summer Olmstead

Tennessee Tech University

The modernization of the national power grid into a “Smart Grid” has the potential to decrease dependency on foreign oil, consumption of non-renewable energy, and emissions of CO₂. Wired and wireless networks, mobile devices, smart appliances, and the interfaces between these technologies introduce opportunities for the exploitation of power system vulnerabilities through cyber attacks, system failures, human error, and natural disasters. While some known security practices and protocols can be utilized, overall security specific to the digital infrastructure is advancing slower than the absorption of computing technologies into the power grid. Fundamental to developing robust, comprehensive computing and cyber security architectures is the identification of computing security issues in smart grid technologies. This research addresses the need of security in the smart grid environment, specific security issues to consider in smart grid technologies, security incidents reported, and research challenges in secure development and deployment of technology in smart grid.

Multiplayer Browser Game Using the Greenfoot IDE

Aristeidis Tzanis and Olamipo Femi Osibote

University of West Georgia

As online gaming has become popular, game enthusiasts are looking for convenient ways of playing interactive/multiplayer games through conventional browsers. However, despite this desire from game consumers, only a few graphically rich multiplayer platform games are being offered online and through a browser.

This research explored the technologies and techniques employed in developing an online multiplayer applet based game using the Greenfoot Java IDE. The Greenfoot IDE features a class browser, interactive execution, single step execution and a code editor. It is designed to provide an environment for creating two-dimensional animations, games and simulations. Although the Greenfoot API was designed to be used in class rooms as an interactive JAVA learning tool, the research explored ways to harness its simplicity, which includes effortless creation of animated graphics and sounds. Furthermore, our research used the development of a multiplayer online game to demonstrate the various tools and features provided by Greenfoot and the versatile nature of Greenfoot as a Java IDE.

The techniques used include character animation, scrolling screen effects, data encapsulation for communication between client and server, the use of JavaScript scripting and prototyping.

Several hurdles had to be overcome including experimenting with two different transfer protocols namely TCP and UDP, and finding ways to pass information between JavaScript and Java for user authentication.

The extensibility of the Greenfoot API, since it is open source, gave us some latitude which allowed the inclusion of classes to the API to provide communication with JavaScript. The research also delved into how Greenfoot can be integrated with the Eclipse IDE so as to take advantage of Eclipse code intelligence and the editor flexibility.

Commercial Off-The-Shelf Software and the Uniform Commercial Code

John McMeen

East Tennessee State University

With a global rise in commercial off-the-shelf software sales, new legal issues have emerged in which old laws do not explicitly cover the terms of sale and use associated with traditional software licenses. Should “outdated” laws be altered or amended to reflect a modern technology dependent culture, or are the current laws sufficient enough? Have software vendors or retailers attempted to comply with current law? This text will examine the Uniform Commercial Code, along with such propositions as the Uniform Computer Information Transaction Act (UCITA) and the American Law Institute's Principles of the Law of Software Contracts. This research proposes new ideas that simplify the current system of commercial off-the-shelf software sales for consumers, vendors, and retailers such as: required upfront disclosure of licensing agreements, standardized software licenses, and in-store software testing. These ideas are proposed to serve as temporary solutions to current problems with commercial software sales until a more definitive and uniform system is developed and implemented.

SMS and SMS Broadcast Vulnerabilities

Joseph Stites

Tennessee Tech University

This research investigates the wide variety of security concerns associated with the Short Message Service (SMS). The growing number of smart phones has created a new opportunity for attackers to misuse the SMS messaging protocol. SMS attacks against smart phones have been proven to be effective. This combined with the transient and ubiquitous nature of cellular telephone ownership has the potential to create new opportunities for attackers seeking to misuse cellular telephone networks. There are additional security concerns for users sending and receiving SMS broadcasts. One of these concerns is the reliability of the SMS broadcast system used. There are a variety of existing SMS broadcasting systems which interact with other existing communications networks, which themselves are vulnerable to a variety of attacks such as spoofing, sniffing, user accountability, and availability. Attacks on social networks which utilize web based SMS broadcasting systems pose a threat not only to the users of those social networks, but also to the cellular telephone networks.

Preventing Phishing Attacks on OpenID using Personally Recognizable Information via a CAPTCHA-based Technique

Jan Durand

Advisor: Dr. Travis Atkison

Louisiana Tech University

OpenID is a single sign-on authentication solution which allows a user to authenticate to any OpenID-enabled service via a provider of choice. It allows for the exchange of identity information between a relying party and an OpenID provider using a digital identifier, typically a Uniform Resource Locator (URL). OpenID was designed to eliminate the need for multiple usernames across multiple websites, with only one sign-on needed per browser session. Many large corporations including Google, Facebook, and Yahoo! are invested in OpenID which validates its appeal. However, due to its decentralized nature, any site can use or provide OpenIDs, including malicious parties. Consequently, phishing attacks are a significant issue in OpenID authentication. This presentation will provide an overview of the OpenID authentication protocol and discuss the security issue of phishing. Also proposed is a solution to help prevent phishing attacks by asserting the credibility of an OpenID provider using personally recognizable information (PRI) conveyed via a CAPTCHA-like image. A 'CAPTCHA-like' image refers to an image designed to conceal its message from non-human observers. Using a CAPTCHA to display information to an end-user helps prevent against automated information extraction by a malicious party.

Protecting The Kernel: Using Integrity and Virtualization

Ferrol Aderholdt

Tennessee Tech University

Virtualization is abstraction where hardware is abstracted such that multiple operating systems (OS) can reside within one physical host. This garners many benefits such as server consolidation, fault tolerance, and even load balancing. In virtualization, a virtual machine monitor (VMM) manages each virtual machine (VM), or guest OS. Recently researchers have been looking at how to leverage the different privilege levels of each VM in a way that it can provide introspection into the VM's memory space. This creates the opportunity for an intrusion detection system (IDS) such that it can be located at a higher privilege level than any malicious software within the VM. This approach is called virtual machine introspection (VMI) IDS. It contains benefits over known host-based and network-based IDSs in that it is both harder to subvert and has a more accurate view of the state within a VM. Most of the VMI approaches lack performance, 64-bit capabilities, and the ability to introspect multiple VMs at once. Our research is looking into these aspects with simple integrity checking techniques on the running kernel. This concept is based off the idea that when unauthorized root-kits become resident within a system, they modify key components of the kernel. We are currently naively checking the portion of the kernel that should not change and detect any changes that are made to these sections by comparing with a "golden image." A prototype has been developed, which works well against changes in the kernel and will eventually be tested against a wide range of known root-kits.

Analyzing and Comparing Scratch Programs

Brittany Stewart

University of Alabama - Birmingham

Mentor: Dr. Jeff Gray

University of Alabama

Scratch is an excellent tool to teach computer science concepts to elementary school students. However, computer programs can be similar to any other assignment or paper done by a student because they can be plagiarized. There is a repository of Scratch projects at the scratch.mit.edu website which contains tens of thousands of Scratch projects that have been uploaded from the general community (typically, these submissions are the creation of a young student). Therefore, it is very easy for students to borrow projects and there are a large number of projects to be borrowed. Teachers may be reluctant to fully integrate Scratch into their classrooms and accept Scratch projects as assignments. There is a critical need for an ability that allows teachers to confirm that their students are not simply downloading projects from the internet and turning them in as their own. In addition to individual assignments in a class, there is also Scratch Day, a competition in which students submit Scratch projects. It is necessary to ensure the authenticity of the projects that are submitted at Scratch Day, but unfortunately it is not possible. Therefore, the specific aim of this project has been to investigate and develop support for this critical need of verifying the authenticity of authorship of Scratch programs. The presentation will summarize the motivation for the project and provide details about the solution developed, which compares a given Scratch project text summary to a directory of text summaries to determine from which projects, if any, the given project could have been copied. The program parses the text summaries and generates a score for the costumes, sounds, and scripts.

This project is supported in part by NSF grant CCF-0702764.

Patient Privacy Protection Through Data Obfuscation and Distortion

Robert Derveloy

Advisor: Yu Cao

University of Tennessee - Chattanooga

With the advent of electronic medical records and the accessibility, communication, and productivity that computer and network resources allow, the question of how to protect the privacy of patients while simultaneously allowing access to the new wealth of data provided by electronic medical records for research purposes becomes apparent. The goal of this project is to create a more secure and trustworthy method of preserving patient privacy in electronic medical records that considers the needs of third party researchers. The proposed algorithm to be used by this project applies a hybrid approach that combines a geometric transformation to distort the original data before applying a nearest-neighbor data substitution on the resulting data. First, the geometric transformation can be implemented using matrix multiplication. Following the geometric transformation, the nearest neighbor data substitution would start by dividing each database field into “neighborhood” clusters. Once the neighborhoods are established, the algorithm will create trees from the field values within each neighborhood with the first field value serving as the root node. Next, the process will order the children nodes in increasing order of distance from the parent and mark the distance between parent and child nodes to the edge connecting them. If a node has appeared earlier in the same path, the node will be marked as a leaf. Once the previous steps have been performed, the paths that have a depth equal to one less than the number of elements within the cluster will be selected as possibilities for substitution. The algorithm will then choose the path with the, “minimum value for [the maximum edge cost counter] as the substitution pattern to produce the new data subset”. Finally, the algorithm will apply the substitution pattern of the first field to the next field that needs to be obfuscated.

Scalable Hierarchical Image Indexing for Content Based Image Retrieval

Rob Fletcher

Advisor: Yu Cao

University of Tennessee - Chattanooga

Currently there exist a myriad of different search engines, and all of these search engines have algorithms behind them that allow us to do incredibly sophisticated things in very small amounts of time. There are many different aspects to a search engine, but perhaps the most important is an intelligent and optimal indexing algorithm. This indexing algorithm is responsible for combing through mass amounts of data, and storing it in a fashion that the user can retrieve their queries in hundredths of a second or less.

In this paper an indexing algorithm will be developed for content based image retrieval combined with text based content. This will be accomplished by first extracting the features in an image through some available open source tools (e.g., the C/Matlab based vision algorithms library VLFeat). VLFeat already has the K-means functionality for clustering feature information, and has the Scale Invariant Feature Transform (SIFT) algorithm to extract features from an image. From there we will take the text abstracts associated with an image and create ranking and indexing for the in a similar fashion, but for text not image content. The final task will be to try and implement a hierarchical K-means algorithm that is influenced by the features in the image along with the text content in the image abstract. The goal would be to provide a more accurate searching algorithm that uses not only image content but text content as well.

Electric Vehicle Simulation for Google Android (EVDroid)

Wade Gasior, Matt McNeely, Brandon Davidoff

Advisor: Yu Cao

University of Tennessee - Chattanooga

The demand for transportation worldwide is constantly increasing. Meeting this demand with traditional modes of transportation powered by fossil fuels is challenged both by environmental concerns and the rising cost and limited supply of petroleum. The need for alternative fuel vehicles is higher than ever, and the perpetuation of the implementation of alternative-fuel transportation is a top priority for the current governments of many countries. Forecasts by the International Energy Agency (IEA) predict that there will be 9 million electric vehicles on the road worldwide by the year 2030.

Accurate range prediction based on an electric vehicle's current battery level is a tool that will greatly assist electric vehicle owners in ridding themselves of range anxiety, while also increasing the adoption rate of electric vehicle technology. Owners of electric vehicles, in general, are also very conscious of their impacts on the environment, and given the opportunity, prefer to drive their electric vehicles in the most efficient manner possible. Our proposed project, EVDroid, is to create a mobile application that assists electric vehicle owners in determining the most energy-efficient driving route between two locations, provides the most efficient choice between destinations offering similar services (e.g. provide the most efficient route from the user's current location to a drug store or grocery store), calculates the estimated energy cost of completing a chosen route, and produces an accurate visual range display (or corrected range radius).

Currently, neither Celadon's Road2 nor UTC's EViSim are mobile-based solutions. Both simulators are web applications designed to be run from a desktop computer. In addition, both applications provide simple point to point simulation. EVDroid will expand on the functionality provided by Road2 and EViSim by providing smart route selection, efficiency-driven similar service selection, and calculated 360-degree range prediction, all on a mobile platform.

Our approach will be based heavily on UTC's EViSim software, to which we have access to the source, and expanded into the application outlined above.

Notes



Student Abstracts
Doctoral Degree Programs

RRA: An Audio Format for Single-Source Music and Lyrics

Madhav Rao

Advisor: Dr. John Lusth

University of Alabama

Karaoke music has world-wide appeal, especially for non-professional singers. However, most karaoke-audio architectures involve separate text and audio data streams which run in different threads. Such an approach suffers from timing synchronization problems. Another drawback is the need for a karaoke system to process at least two different formats: one used for karaoke-text and other used for audio data. To reduce the existing complexity of karaoke generation and thus make it more accessible to beginning computer science students, a novel audio format is introduced in this paper. To produce a karaoke track, lyrics are embedded as textual comments within a readily-readable-audio (RRA) file. The RRA format is an uncompressed and textual representation of a sampled audio stream and can be easily read and written by first and second semester computer science students without the need of an audio library. It is designed to allow comments that serve as directives to post-processing audio filters, including music players themselves. A lyric-aware RRA player will display lyrics as the audio track is played while a non-aware player simply ignores the embedded comments. The new audio format and utilities are currently used in the introductory computer science sequence at the University of Alabama. This paper also presents a wide variety of RRA multimedia projects for students, including karaoke generation.

Bridging the Semantic Gap in Building Biomedical Information Systems Using Concept Maps

Varadraj P. Gurupur

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In the field of biomedical informatics, a common problem experienced when building applications is determining how to transfer rich domain-specific knowledge to a software developer for optimal machine processing. One approach to bridging the gap between the domain experts and the knowledge engineers is to encourage the representation of biomedical knowledge in the form of graphically represented concept maps enabled by Semantic Web technology. Such technology can be found at the Institute of Human Machine Cognition (IHMC), which spearheaded development of their version called C-Map Tools which allows for the conversion of graphical concepts into machine-actable code, such as HTML, XML, and Web Ontology Language (OWL). In the case of OWL, advanced reasoning can be achieved by intelligent agents traversing and processing pre-defined semantic associations developed by domain experts and maintained in a web of knowledge using concept maps. In this presentation, we present an implemented prototype for using concept maps to gather data for a gene linkage application demonstrating the use of concept maps to accelerate biomedical research, thereby saving time and money with possible improvements to quality as well.



Grammar Inference Technology for Model Co-Evolution

Qichao Liu

University of Alabama - Birmingham

In software engineering, new techniques and methodologies are often developed with the aim of simplifying the software development process and improving software productivity. Model-driven engineering (MDE) focuses on creating abstractions that represent an alternative to the classical code-based development. In MDE, models and metamodels are considered the primary software artifacts, with the philosophy that “everything is a model.” As model-driven software development becomes more popular, managing the model co-evolution problem (which is focused on maintaining the fidelity between metamodels and their conforming instances) becomes a challenging issue. It is a tedious and error-prone task to track the various versions of metamodels as a metamodel evolves across the phases of design, implementation and maintenance. Whenever a metamodel changes, the model instances created using that metamodel may not be used by the underlying modeling tool directly anymore.

In the field of programming languages, there is a similar problem known as grammar evolution. As a result, “grammar recovery” (or grammar inference), a technique of prime importance for software renovation, was brought up to solve the problem. Specifically, a grammar recovery system was invented to work with grammar transformation to construct a grammar extracted from development resources to parse existing language instances. Following the idea of grammar recovery, the research described in this abstract starts with the concept of metamodel recovery, which enables the reconstitution of a metamodel from inferences that can be made from sets of conforming instance models. The proposed presentation will discuss our work toward applying Grammar Inference (GI) technology to the area of model co-evolution; specifically metamodel recovery and model transformation.

A Statistical Approach to Grammar Inference

Upendra Sapkota

University of Alabama - Birmingham

Context Free Grammars (CFGs) constitute an important class of grammars and are widely used in programming language descriptions, natural language processing, compilers, and other areas of software engineering where there is a need for describing the syntactic structures or programs. One such application is to Domain Specific Languages (DSLs), the languages dedicated to a particular problem representation/solution technique. However, it is difficult for domain experts, who do not have enough knowledge about programming languages, to design the specifications of DSLs, although they can develop examples of the kinds of programs they would like to write. Grammar inference (GI) is the induction of CFGs from samples and is a challenging problem. Using GI, we want to generate DSL specifications when only the DSL samples are available. We propose a GI approach which uses the techniques of natural language processing to help solve the DSL design problem for domain experts. The use of the n-gram approach to the sample data generates basic grammars and the Cocke-Younger-Kasami CFG parsing algorithm further generalizes the grammars. GI using the Inside/Outside algorithm also helps in generation of Stochastic Context Free Grammars.

Diagnosis between Melanoma and Nevi from Images of Skin Histology Slides by using SVM Classifier

Song Gao

University of Alabama - Birmingham

The determination of the extent of any malignancy from a histology slide can be difficult for a pathologist, with the differential diagnosis between malignant melanoma and benign nevi one of the most challenging.

A significant amount of previous computational work on distinguishing melanoma from nevi has focused on machine learning from observation of suspicious moles on the skin. But much less work has been done on classifying melanoma on the basis of prepared slides of lesions from patients.

We propose a method using a Support Vector Machine (SVM) to classify and diagnose skin biopsies from patients as either melanoma or nevi based on images of H&E stained histology slides alone (approximately 4 images per patient at 40, 100, 200 and 400 times magnification). Our method differs from other approaches to digital melanoma diagnoses in using the histology slide, not digital clinical pictures of the patients' skin to make the classification. To the best of our knowledge, no other group is distinguishing between melanoma and nevi on the basis of histology slides. Using only the histological criterion of irregularities in the nucleus, our best SVM utilizes nucleus perimeter/area ratio and nucleus major/minor axis length ratio as features to give a classification accuracy of 90%, sensitivity of 100% and specificity of 75% at magnification of 400 times in our data set. The performance is remarkable given a dermatological pathologist typically examines a plethora of features to make a diagnosis. Our SVM in conjunction with clinical digital diagnoses systems could reduce the number of missed melanoma diagnoses.

Finding Bands in Optical Coherence Tomography Images Using Curve and Function Fitting

Douglas Ross

University of Alabama - Birmingham

A method to determine the position and thickness of three hyper-reflective outer retinal bands in optical coherence tomography images closest to the posterior chamber of the eye is presented. Optical coherence tomography (OCT)[1] can be used to create images of cross sections of biological tissue including the retina. OCT scans consist of multiple depth scans in a linear array to create the 2-dimensional image. Evaluation of these images can be used to diagnose abnormal structure due to disease or damage. The principle task in evaluating the images is segmentation. While the images can be evaluated by trained personnel the volume of data obtained by this method is increasing and many automatic segmentation methods have been implemented to reduce this work load. These methods use a variety of means including edge detection [2], curve [3] and spline [4] fitting, graph cuts [5] and shape and texture analysis [6]. The method presented makes use of the geometric band structure to guide initial segmentation and a function fitting method to determine features that could not be found directly with image processing techniques. High reliability patterns of peaks and valleys are found in the cross section of the image corresponding to the three outer retinal bands. The high reliability peaks are connected using an annealing technique to fit a polyline. A summation of Gaussians is fit to each scan line using the initial peak locations to create a differentiable function to describe the bands. The location of the width of the bands is based on the points of inflection (zero second derivative) for the total curve.

- [1] D. Huang, et al., "Optical coherence tomography," *Science*, vol. v254, p. p1178(4), 1991.
 - [2] M. Bagci, et al., "Thickness profiles of retinal layers by optical coherence tomography image segmentation," *American journal of ophthalmology*, vol. 146, pp. 679-687, 2008.
 - [3] T. Fabritius, et al., "Automated segmentation of the macula by optical coherence tomography," *Opt. Express*, vol. 17, pp. 15659-15669, 2009.
 - [4] Mishra, et al., "Intra-retinal layer segmentation in optical coherence tomography images," *Opt. Express*, vol. 17, pp. 23719-23728, 2009.
 - [5] M. K. Garvin, et al., "Intraretinal Layer Segmentation of Macular Optical Coherence Tomography Images Using Optimal 3-D Graph Search," *Medical Imaging, IEEE Transactions on*, vol. 27, pp. 1495-1505, 2008.
 - [6] V. Kajić, et al., "Robust segmentation of intraretinal layers in the normal human fovea using a novel statistical model based on texture and shape analysis," *Opt. Express Optics Express*, vol. 18, pp. 14644-14653, 2010.
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Tracking Spammers with Sender's Name and Domain name

Soma Halder

University of Alabama - Birmingham

Spam or junk emails are a great nuisance to people accessing the World Wide Web. Not only do they occupy bulk of space of our email inbox, they also spread malware, lure users to phishing sites or set up user computer as botnets, so the users in turn start sending spam emails. Traditional anti spamming methods involve the use of spamming filters where spam emails are prevented from entering the inbox but no legal steps are taken to track spammers. In contrast, domain blacklisting is a way to shut down spamming sites but they are not completely efficient in terms of tracking spammers. We propose a measure which tracks spammers and thus enable legal actions to be taken. We have a set of spam emails as our input and we do a fuzzy matching of the Sender's Name and the IP address of the link they point to. Finally we cluster emails (the sender name-domain IP pairs) based on some threshold values. Essentially, emails in the same cluster are sent by the same spammer. Tracking the WHOIS information at any point of time helps to trace the Spammer or the Agency sending the messages.

Watching Black Market Internet Relay Chat (IRC) Rooms

Jason Britt

University of Alabama - Birmingham

Cybercriminals use a variety of techniques such as phishing, spreading malicious software, and system intrusion, to steal financial information. The stolen financial information can be sold by cybercriminals on illegitimate or black markets some of which exist on unlogged internet relay chat (IRC) rooms.

The project's goal is to use publicly available communications in black market IRC chat rooms to create law enforcement actionable information such as the type of information for sale, cyber criminals' ip addresses, contact emails, and instant messaging accounts.

To meet the project goals a number of black market IRC chat rooms were identified and several days of communications analyzed, which yielded law enforcement actionable information and interesting trends.

Notes



Professional Abstracts



10,000 New Computer Science Teachers by 2015 – How can we help?

Wayne Summers

Columbus State University

“Innovations in computing and more broadly, information technology (IT), drive our economy, underlie many new advances in science and engineering, and contribute to our national security. Projected job growth in IT is very strong.” [NSF]

“Despite these very positive indicators, student interest in computing has declined dramatically over the last decade. For example, the percentage of college freshmen indicating an intent to major in computing has declined overall by 70% in the last decade; for women, the decline was 80% (HERI, 2000-2009). Recent data show that student interest in computing majors has fallen behind projected job openings by a factor of five and a half (ACT, 2010).” [NSF]

This presentation will explore ways the academic community can help the NSF initiative to train 10,000 new Computer Science teachers by 2015. Several initiatives that our university has implemented over the past several years include one-day weekend teacher workshops and one-week long summer teacher workshops on technologies that can be used to teach computing to K-12 students. This presentation will present some of the technologies covered in these workshops. Our newest initiative is a teacher endorsement program for computer teachers. It is available for pre-service undergraduate and graduate students on campus and as an online program for in-service teachers.

1. ACT: American College Testing Program (2010), The Condition of College and Career Readiness, Retrieved September 20, 2010 from http://www.act.org/research/policymakers/cccr10/index.html?utm_campaign=cccr10&utm_source=data10&utm_medium=web
 2. Higher Education Research Institute (HERI), College Freshmen Survey, 2000-2009.
 3. NSF Computing Education for the 21st Century (CE21) call for proposals, <http://www.nsf.gov/pubs/2010/nsf10619/nsf10619.htm>
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Introduction to Visual Analytics for Command, Control, and Interoperability Environments: A Special Topics Course

Jacqueline Jackson

Jackson State University

How do Computer Science programs keep students aware of emerging technologies? One mechanism that is used at Jackson State University is the Special Topics Course. The Special Topics course allows a professor to introduce students to current emerging technologies. These courses are optional but give students additional exposure to what is currently happening in the field of Computer Science.

One such emerging area is Visual Analytics. Visual Analytics combines visualization with analytical reasoning. Its tools allow individuals to derive meaning and predict trends from mass amounts of data that is often ambiguous and incomplete. Visual Analytics is multidisciplinary in nature and can be used to provide solutions to problems in Computer Science, Biology, Economics and most recently homeland security¹.

This presentation will provide details on the Visual Analytics Special Topics course taught at Jackson State University. The course was designed to prepare students to conduct research in the area of visual analytics. Students were exposed to current visual analytics projects with an emphasis on VACCINE. VACCINE (a US Department Homeland Security Center of Excellence led by Purdue University) creates methods and tools to analyze and manage the vast amounts of information for mission critical areas of homeland security. Each student who successfully completed the course demonstrated a knowledge of: the fundamentals of visual analytics, tools and procedures of visual analytics, and how visual analytics can be used to assist homeland security personnel.

¹ What is Visual Analytics? Retrieved January 24, 2010 from <http://nvac.pnl.gov/about.stm>

A PHP-based Web Frontend for a Molecular Dynamic Computational Software Package

Haifei Li

Union University

Molecular dynamic (MD) simulations of complex gas-phase reactions are a very important research tool for the petroleum and automobile industries. A tool called AMolDC (Accelerated Molecular Dynamics with Chemistry) has been developed at Union University. AMolDC is an extremely efficient set of computational tools but currently has as its main target the advanced users that has both strong computer science and chemistry backgrounds. Since it was written in C and runs under a Linux environment, users need to be comfortable with not-so-user-friendly command line interfaces. Its strong requirements on computer background limit its huge potentials for wide adoptions and distributions. This paper describes the research and development efforts that have been done to develop a web frontend to the computational tool set. Three programming languages have been used: C for the computational tasks, PHP for the web front end and Java for 3D display of molecules in a cubic chamber. In order to minimize the impact on the existing C programs, a dynamic compilation approach is adopted to expose the simulation parameters to the end users. At the end, user is able to enter MD simulation parameter values and visually see the movement of atoms in a cubic chamber.

GUI Rather Than Standard Console I/O in a Beginning C++ Course

Otha Britton

University of Tennessee - Martin

For the best way to teach a beginning C++ course the argument for years has been whether to teach objects first or objects last. Some textbook authors have even written multiple versions of their textbooks in order to satisfy proponents of both methods. For both of these approaches, however, the input and output were handled using standard keyboard input with “cin” and display monitor output with “cout.” During recent years some authors have taken a totally different approach; that is, use GUI for input and output. Their argument is that the black box console application is uninspiring at best, and students in Visual Basic routinely build GUI programs in introductory courses while C++ students (and, for the most part, Java students), struggle along with the old black box console screen. Teaching GUIs early on in C++ is practically impossible to do in a beginning course if the instructor attempts to use traditional C++ commands with or without a graphical programmers interface such as OpenGL. These authors have overcome this formidable obstacle by utilizing powerful, but free, integrated development environments (IDEs) such as Microsoft’s Visual C++ Express. This approach has some obstacles but is indeed doable. The presenter will demonstrate this technique by utilizing Visual C++ 2008 Express to construct a simple GUI and the underlying program to process it, similar to how the textbooks guide beginning students through the process. This will hopefully inspire some hospitality room discussion on whether this approach is a good idea.

An Investigation of the CS0 Boot Camp Technique on CS1 Student Performance

H. Erin Rickard

Coastal Carolina University

Previously we presented a “boot camp” curriculum approach to the introductory CS0 programming course at Coastal Carolina University. This technique required students to write over 350 short programs during the course of a semester. In addition to a number of positive student evaluations, the passing rate improved as compared to previous CS0 courses that utilized a different approach. This study is an extension of that work, as we investigate whether or not the CS0 course had a positive effect on subsequent student performance in CS1. Data sets were comprised of student scores from the CS0 class in Spring 2009 and Fall 2009 and from the CS1 class in Fall 2009 and Spring 2010. Across both semesters, the overall passing rate in CS0 remained high (93.98%). Of those who passed CS0 and later attempted the CS1 course, performance varied. Notably, students who performed at the highest levels in CS0 more frequently went on to pass CS1 (93.94%). Conversely, those with the lowest passing scores in CS0 were less likely to succeed later in CS1 (20%). Over the two semesters included in this report, the passing rates in CS1 were less optimal (75.00%). However, the difference in the passing rates between students who had previously taken CS0 with the “boot camp” approach (74.60%) and those who had not (76.92%) appears negligible. This suggests the need to continue to evaluate student performance in these courses. Additionally, data from the CS2 course will be incorporated in the analysis as it becomes available.

Educating the Non-Programers, Tools for HTTP Instruction

Jeremy Ey

Tennessee Tech University

With the ever-increasing pervasiveness of computing into other discipline areas comes the challenges of explaining computing concepts to a more diverse audience than traditionally seen. One such area where this can be seen is the variety of technical knowledge and aptitude of students interested in web design.

This presentation will cover tools for introducing HTTP messages and concepts to freshman students. Such students lack the programming background required for methods traditionally used with upperclass Computer Science students. This presentation will be a survey of the types of tools available. Additionally, selected tools will be demonstrated and discussed. These tools have been used by the author in the introductory course for Tennessee Technological University's Web Design program, taught to both majors and non-majors. These tools provide a means for both viewing HTTP traffic within web browsers as well as free standing applications.

An Applet Package for CS0

William H. Hooper and Joyce Blair Crowell

Belmont University

The CHApplet package provides a wrapper for the Java Swing API that is robust, flexible and accessible to beginning programmers. It provides consistent methods and processes for lines, rectangles, ovals, arcs, polygons, curves, labels, containers, fields, buttons, images and sounds. Actions have a simple three-method interface, and each action executes within a separate thread that is explicitly terminated. Multiple actions run without conflict, and the underlying Swing toolkit allows many objects to move simultaneously without flicker or motion artifacts.

Tutorials built around CHApplets are part of a 14-week Introduction to Computer Science (CS0). Each tutorial presents partially completed project, which includes a working example of one important concept (e.g., conditionals), then leads the student to build variations from that example to complete the project. Testing requires students to write original code, and most students are able to implement collections of multiple shapes quickly and confidently. About halfway through the semester, students begin their own projects, each student completing the code on his/her own. Students adapt complex concepts from the examples to original, creative projects.

Students who begin programming with the CHApplet package have a relatively simple transition into our Java-based, object-oriented Programming I (CS1). CS0 is open to students with entrance ACT's as low as 22, and is not even recommended for most CS majors; it's offered primarily as a General Education alternative to the Mathematical Reasoning course. Nevertheless, we find that 10-15% of the students in CS0 elect to continue to CS1, where they perform on par with their peers who skip the course.

Real-time Community Building with the Twitter API

Semmy Purewal

Georgia Gwinnett College

The Twitter API is a useful tool for creating real-time components of web-sites, but it can also be used to help foster a sense of community in a small department or college campus. In this talk, I'll introduce Twitter and the Twitter API. I'll describe how I've used it to develop mini real-time applications that have been used in computer science departments and at community events. In addition, I'll introduce Spotter, a free JavaScript library that allows for simple real-time Twitter integration into web sites and in web applications.

Deploying DBMS issues on Cloud Computing platforms

Muhammad Ghanbari

Alabama A&M University

Since 1961, Envision of McCarthy, “Computation may be organized as a public utility”, and Amazon’s Cloud Computing approach in 2006, “Elastic Computing Cloud (EC2)” and today’s shared hosting platform economics reflect continued resource infusion at the compute processor, memory, and bandwidth levels. Without this expanded capacity, the abstraction levels necessary to effectively isolate customers wouldn’t be possible. So, as IT departments are asked to cut costs, they are now beginning to look at managed services like cloud-based services. The benefits of both reduced capital and operational expenses are tremendous. Moreover, the combined influences of increased adoption of virtualization technologies, service-oriented architectures (SOAs), and omnipresent computing standards have expanded the availability of lower-cost and massively scalable computing-related services. Additionally, feature-rich user interfaces are now easily developed and deployed, meanwhile low cost, and immediate connectivity will be fulfilled.

This paper, discusses some important aspect of Cloud Computing, DBMS on the Cloud, the limitations and opportunities of deploying data management on Cloud Computing, and finally some issues on cloud computing platforms.

ShopTalk: A Mobile Grocery Shopping Application for the Visually Impaired

John Nicholson

Austin Peay State University

One of the most functionally challenging environments for individuals with visual impairments is the modern supermarket due to its size and the number of products offered for sale. When shopping, a person with a visual impairment often relies on a sighted assistant and must work around the assistant's availability. The need for a sighted assistant reduces opportunities for spontaneous shopping trips and limits personal independence.

This presentation will discuss ShopTalk, a mobile system designed to assist shoppers with visual impairments in supermarket environments. ShopTalk generates verbal route directions and verbal search instructions that enable shoppers, including those with complete vision loss, to find specific items located in the aisles of large grocery stores without the need of a sighted guide. The system does not require any modification of the store environment or installation of specialized hardware. Instead, it relies on the navigation and mobility training of the shopper and the fact that many stores now use inventory control systems that place labels with barcodes on shelves. Verbal instructions are generated from spatial information stored in a topological map describing navigational decision points in the store environment and a barcode connectivity matrix mapping barcode locations in aisles. The system has successfully been tested in a real world grocery store with multiple participants having visual impairments ranging from partial vision to complete vision loss.

For Girls Who Aren't Afraid of a Mouse: The Miss-Adventures of Nancy Drew Computer Games for Girls

Beth Walker

University of Tennessee - Martin

It is a myth that girls do not play computer games; indeed, much has been written about using games especially designed for girls to encourage their interest in computer science. But the quality of those games as well as the depiction of the heroines can vary wildly within the genre. With a nod to her famous predecessors, Laura Bow and Laura Croft, Nancy Drew has made a late but commercially successful transition from long-running book series to PC mystery-adventure game series. In fact, most of the titles in this game series are based on actual Nancy Drew books. However, Nancy's platform publisher, Her Interactive, has made substantial game-play changes not only to the plots of these much-beloved books but also to Nancy's characterization--ironically promoting gender stereotypes and often-held assumptions about gender and game-play preferences in the process. Of special interest to gamers and programmers (of either gender, any age) is linear vs. non-linear narrative, strategies for plotting clues and climaxes, and the physicality of the point-of-view character. Overall, this series earns high marks for creating a suitably spooky atmosphere and for providing logical puzzle-solving skills but suffers from repetitive and slow game-play, tedious and sexist tasks, and an uninspiring depiction of one of popular literature's most recognizable heroines.

Using Alice to Promote Interest in Computer Science

Chelsea Rath and Brenda Parker

Middle Tennessee State University

As a participant in the Partners for Innovation in Information Technology (PIIT) National Science Foundation (NSF) grant, several week-long workshops were held concurrently for a group of high school students related to robotics, multimedia and using the Alice program. Experiences related to the delivery of the Alice workshop as well as a brief summary related to the effectiveness of this workshop will be presented. Suggestions for delivering an Alice workshop for high school students as well as information related to participant surveys will also be shown.

Improving Retention of Computing Majors

Dr. Suzanne Smith and Kellie Price

East Tennessee State University

The Department of Computer and Information Sciences at East Tennessee State University is facing a problem common to most universities and colleges – the retention of first-year computing majors. To address this problem, researchers from this department have presented, in previous ACM Mid-Southeast conferences, a CS0 course that was developed at ETSU in an effort to better prepare and retain students as computing majors. The department has come to realize that with limited departmental resources, it is not feasible to require all CS majors to take this CS0 course; therefore, the development of a mechanism for effectively filtering students into this course was necessary.

While discussing this filtering mechanism with the faculty teaching the CS1 course, it has become apparent that there were three distinct sets of students in CS1: weak students who are not successful in CS1 due to a lack of logic processing skills and mathematical background, students for whom the pace and content of CS1 are appropriate, and students who have a strong background in programming or math and are not challenged by the content and pace in CS1. Therefore, the decision was made to develop a filtering mechanism, which included a test, to place students in either CS0, CS1, or an accelerated section of CS1. This filtering mechanism and placement test as well as their effectiveness will be described. Anecdotal observations from the filtering of students into three separate courses will also be presented.

MapReduce: A Programming Model for Manipulating Large Datasets

Srinivasarao Krishnaprasad

Jacksonville State University

With the widespread use of computing and communication infrastructures throughout the world comes the need for efficient and reliable processing of huge sets of data gathered by the various digital media. Performance considerations naturally demand parallel and distributed programming techniques to be applied during the development and implementation of these applications. Developing parallel and distributed programs is not easy, to say the least. Added to this is the need for reliable and fault-tolerant computing when the computing elements are dispersed and likely to fail randomly.

In this talk we present an overview of a popular tool named MapReduce, developed within Google Inc., to simplify large-scale data manipulation and result generation. MapReduce uses automatic parallelization and distribution of work load, facilitates fault-tolerance and provides a simple programming abstraction for application development. The application scenario suitable for the underlying programming model is as follows [1]: The computation takes a set of input key/value pairs and produces a set of output key/value pairs. The user specifies the desired computation with two functions: `Map()` and `Reduce()` from the MapReduce library. `Map()` takes an input pair and produces a set of intermediate key/value pairs. The MapReduce library groups together all intermediate values associated with the same intermediate key `k` and passes them to the `Reduce()` function that merges together these values to form a possibly smaller set of values. The input dataset is automatically partitioned into several splits and the `map()` calls are distributed across several processors. `Reduce()` invocations are likewise distributed across several processors by splitting the intermediate key space into several splits. Typically, these activities are handled by one master task and several worker tasks. The master dynamically assigns work to available workers. Fault tolerance is a critical issue when thousands of processors are working on terabytes of data. Worker failures are handled in MapReduce model as follows: The master pings each worker periodically. If a worker does not respond within a time limit it is assumed as failed. Computations will be accordingly rolled-back to prior states and rescheduled. Additional information about and several interesting applications of MapReduce paradigm appear in [2].

REFERENCES

[1] "MapReduce: Simplified Data Processing on Large Clusters," Jeffrey Dean and Sanjay Ghemawat, Communications of the ACM, January 2008, pp 107-113.

[2] <http://www.mapreduce.org/>

A Report: New Virtual Lab Software

Willard Munger, Ph.D. and Scot Anderson, Ph.D.

Southern Adventist University

It is far easier to maintain a Cloud compared to maintaining a lab of three or more computers per station for Unix Administration, Networking, Network Security, and similar classes. At first glance it appears fairly simple to setup and support a lab using virtual computers and virtual networks. After significant time evaluating appropriate software, both open and closed sourced, it became obvious, that permissions were missing allowing professors to assign resources and student to create, setup, and used virtual machines and networks. To solve this problem Southern Adventist University's School of Computing is using undergraduate students to develop open source virtual lab software.

From LEGO Robotics Summer Camp Projects to CS1 KAREL Assignments

Cen Li

Middle Tennessee State University

Funded by the NSF Partner For Innovation grant, in the summer of 2010, the CS department at MTSU hosted 3 week-long summer computing camps for local high school students to promote interests in Computer Science. One of these three camps offered is the Robotics camp.

The camp students were organized into teams working on building and programming LEGO NXT robots. A number of projects were designed/adapted to give a gradual introduction to the robot movements, sensing, and programming. The “Park your vehicle” project allows the students to get familiar with motor movements, the relationship among speed, time, and distance, as well as developing program with sequential statements. The “Push the cans” project taught the students about light and ultrasonic sensing, and programming with loop constructs. The “follow the line” project taught the students conditional statements. The “Move between the lines” project taught the concept of counter controlled loops. The final grand-challenge “fetch the balls” project required the students to integrate various techniques to solve a complex task. The experience and lessons learned from designing and instructing high school students on these projects will be discussed.

The level of difficulty involved in projects 3, 4 and 5 are comparable to what are taught in the beginning part of CS1 class at MTSU. In the CS1 class, the first 3 weeks of the semester were used to give the students a “gentle” introduction to programming through KAREL programming. Inspired by the fun yet challenging summer camp projects, three new programming assignments and two additional closed lab assignments have been designed to teach the CS1 students the concepts of conditional statements, counter-controlled loop, and one-dimensional array in the context of KAREL programming. The experience and lessons learned from designing and teaching these material in the Fall 2010 semester will be shared.

An Application of Data Mining and Neural Networks for the Determination of Stock Trading Pairs

Willie Bossie

Alabama A&M University

Pairs-trading is a trading strategy that involves buying one asset (being long or bullish) and selling another asset (being short or bearish) or using one asset to predict the value of another asset. This strategy involves finding two assets or securities that have a historical relationship in term of their security price. The goal of this research project was to perform a data mining operation on a large database of stocks to find any pairs-trading price ratios if they exist. The database consisted of approximately 13,000 stocks traded on the United States stock exchanges. To perform the data mining, a feedforward neural network, trained using the back-propagation of errors learning algorithm, was utilized to search the database to extract any relevant pairs-trading stocks. Once these stocks were identified, simulation trading on untested data was performed and the simulation results saved. The result of the data mining operation was compared to a native buy-and-hold strategy to gauge the effectiveness of the data mining operation. The trading simulation results for the data mining pairs-trading strategy average a trading profit of \$21.76 per stock verses \$4.02 trading profit per stock for the buy-and-hold strategy. The pairs-trading data mining operation showed great promise for allowing investors to capture greater trading profit.

Command-line Windows Forensics Tools: Advantages, Disadvantages and Compatibility Issues

Lydia Ray

Columbus State University

The computer forensic software is the most important component of a digital forensic investigation. Different types of investigations require different types of forensic software. For criminal investigations where the main task is to extract and analyze files from system storage devices, integrated GUI based tools are most useful. However, these complex tools are not very effective for finding traces of malware, virus or rootkit in an infected or intruded computer system. Different types of malware, virus or rootkit leave footprints in different places in a system. For such forensic analysis specialized single-task tools are more effective. Many experts have built simple command line tools for very specific purpose such as live response or memory analysis, executive file analysis or Windows registry analysis. The advantages of these tools are manifold. These tools are easy to learn and use, and are therefore very effective for pedagogical purpose. These tools are inexpensive and utilize very little resource compared to integrated commercial tools like EnCase or AccessData. Also, these tools are open-source and can be modified according to specific requirements. The only disadvantage of these tools is that most of these may not be compatible with different versions of an operating system. A complete set of Windows forensic analysis tools is available with the book “Windows Forensic Analysis” by Harlan Carvey. While these tools, written by the author in Perl scripts, are extremely efficient for different types of analysis, a number of them are only compatible with Windows XP and lower. We have analyzed the compatibility issues of these tools for Windows Vista and Windows 7. In this presentation, we will describe the functions and compatibility issues of these tools from both forensic and pedagogical perspectives. We will also demonstrate a few tools which we modified for Windows 7.

Developing and Teaching a Robotics Course

Xuejun Liang

Jackson State University

A new robotics course has been created and taught since the last fall semester to both senior undergraduates and graduate students. The major topics of this course are involved in the field of intelligent mobile robots, including robot control architectures, localization, navigation, sensing, planning, and uncertainty. The key component of this course is robot programming, which poses many challenges because it needs to deal with failures, uncertainty, and real-time constraints. A great effort is made to adopt and develop robot programming projects that will be suitable for our underrepresented students and can be used to demonstrate ideas covered in the major topics and to learn cutting-edge robot programming technology.

The iRobot Create robot and the ASUS Eee PC, the Player/Stage software package, and the Tekkotsu software framework are used in our robot programming projects. Four major robot programming projects have been adopted and developed. They are (1) Following waypoints with using odometry data, (2) Searching and approaching targets by using behavior coordinating, (3) Planning a path by using wavefront algorithm, and (4) Getting a robot to localize itself within a maze, navigating efficiently between locations, observing targets in the maze, and reporting on what it has seen.

In this presentation, the selected robot and two software packages will be introduced first. Then, the above robot programming projects will be detailed in the following aspects: (1) Task and steps to accomplish the task, (2) Programming model (structure) and skills, (3) Concepts, algorithms, and mathematical formulas, and (4) Issues regarding to failures, uncertainty, and real-time constraints.

Living on the Bombing Range: The Expanding Role of Remote Services

Eric L. Brown and Jeremy Ey

Tennessee Tech University

The role of laboratory experience has been in constant change in technology-based disciplines for the past decade. With the advent of cheaper, more efficient, more mobile technological tools, students spend less time in the traditional, structured computing facilities and more time in unstructured, social facilities where collaboration more than isolation is the rule.

This model is not unexpected as computing disciplines have stressed team dynamics as an essential part of the design and development processes for the past 30 years. In parallel to the team model, mobile computing devices are cheaper and more prevalent in society. Freshmen entering the university are no stranger to personal data assistants (PDAs), smart phones, and laptops. The mindset is not one of convenience but expectation.

In order to meet these expectations, university departments must rethink the concept of a “computer lab.” Consideration must not only include the discussion of equipment but of distance and location. In an era of distance education, pandemic planning, and business continuity goals, the question must be asked, “How do I teach without a classroom or laboratory? How do I instruct in the absence of a face-to-face environment?”

With the current financial climate in the university environment, continued funding of traditional computing footprints becomes increasingly difficult. This is especially true if such environments are no longer meeting current needs. Future computing needs must be answered with determination and forward thinking.

This presentation will highlight the efforts being undertaken in the Department of Computer Science at Tennessee Technological University to meet these new demands while at the same time decreasing support and maintenance costs. This work builds on our previous efforts to provide remote services and access while continuing to address the ever changing computing needs of academic teaching and research.

Distributed Remote Sensing Image Information Mining with DryadLINQ

Jiang Li

Austin Peay State University

This study proposes an architecture for high-performance distributed information mining from remote sensing image archives utilizing the latest research and development tools such as db4o object-oriented databases (OODB), Dryad distributed computing engine, DryadLINQ language integrated query programming model, and Windows High Performance Computing (HPC). db4o supports the native query which allows a seamless integration between a object-oriented programming language like C# and the OODB, an approach more efficient than the traditional object-relational mapping model. Dryad is a general-purpose distributed computing engine developed by Microsoft that handles some of the most difficult aspects of cluster-based distributed computing such as automatic scheduling of processes on the cluster machines. DryadLINQ combines Dryad with the Language Integrated Query (LINQ) programming model to simplify the task of writing parallel applications. With DryadLINQ, the code for a program running on multiple computers to process distributed data looks just like the code of a sequential .NET program using LINQ. It transparently converts a LINQ query into a distributed Dryad application and executes it on a cluster built upon HPC Servers, which provide a complete and integrated cluster environment including the operating system, a job scheduler, message passing interface support, and cluster management. The data used in this study are Landsat 5 multispectral satellite images that consist of 7 bands responding to different characteristics on the ground. Landsat 5 has a moderate spatial-resolution that is coarse enough for nationwide coverage, yet detailed enough to characterize human-scale processes such as urban growth, for example, it will not show individual houses but will reveal large man-made objects such as highways. The architecture of the mining system has three major components: knowledge representation, data mining, and distributed computing. A cluster with a head node and eight computing nodes has been implemented.

Sketchmate: An Instructional Tool for Splay Trees

Michael C. Orsega

The University of West Georgia

This presentation introduces a new program (Sketchmate) designed to teach the splay tree data structure. While other splay tree programs currently exist, Sketchmate aims to assist instructors in the classroom by providing a set of unique features. Similar to other programs, Sketchmate allows users to display animations for insert, delete, and find operations. However, Sketchmate also gives users the ability to quickly create a specific splay tree configuration. This functionality is critical for instructors wanting to demonstrate an operation from the textbook during class or office hours. Additionally, Sketchmate allows users to revert back to any previous configuration of the splay tree. Once again this functionality becomes important when a student asks a question about a previous state of the tree, or if they simply want to watch the animation a second time.

During development, partial versions of Sketchmate were informally user tested. When the program was in a usable, stable state, two experiments were run to compare Sketchmate to traditional tools. The first experiment was a within-subject, post-test only design. Participants were asked to prepare lecture notes by drawing a variety of splay trees using either Sketchmate or paper/pencil. Results showed those using Sketchmate prepared more trees in significantly ($p < .01$) less time, with those trees being more accurate than those done with paper/pencil.

The second experiment was an across-subject comparing Sketchmate to the whiteboard when delivering a short splay tree demonstration. Participants were given a specific splay tree and then asked to demonstrate a single splay tree operation. Following the demonstration, participants were asked to demonstrate two other operations on that same tree. Those using Sketchmate were able to respond to the follow-up questions significantly ($p < .01$) quicker and more accurately than those using the whiteboard.

Graduate School in Computing: Why? When?

Phil Pfeiffer

East Tennessee State University

A graduate degree in computing, as a rule, provides value that exceeds the cost of obtaining one, in the form of increased competency, higher wages, and opportunities for more interesting work. Graduate assistantships that cover all or most expenses are readily available for full-time students with reasonable (3.0 or better) undergraduate GPAs. Choosing programs based on learning styles and interests is strongly recommended, since graduate programs vary widely in emphasis and culture. Other graduate-school-related choices with no clear-cut best option include work before starting graduate school (money and experience vs. time), attending school part-time (money vs. time and lack of distractions), and, in programs that offer these options, whether to pursue a thesis or a project capstone (depth vs. certitude of a timely graduation).

Experiences of Organizing Computer Science Summer Camps for High School Students

Zhijiang Dong

Middle Tennessee State University

Middle Tennessee State University, partnered with Nashville State Community College and Alabama A&M University, was funded last year by NSF for the three-year project named Partners for Innovation in Information Technology (PIIT). The goal of the project is to improve enrollment and retention rates in Computer Science and Information Technology (CS/IT) in three universities. One event supported by PIIT is to offer three computer science summer camps for high school students in each campus from 2010 to 2012. In summer 2010, MTSU held three camps: Alice, Robotics, and Multimedia. In this presentation, we will share our experiences of organizing computer science related summer camps for high school students, more specifically, various approaches to advertise the event in local high schools, different activities held during the summer camps, feedbacks from high school students, and lessons we have learned.

How Do We Improve the Pass Rate in a CS1 Course? One School's Attempt

Kathy Winters

University of Tennessee - Chattanooga

Do your students come to you ready to take a problem statement and turn it into a Java program? Do you struggle with teaching the syntax of the Java language while teaching problem solving? Do your students come to equipped to develop Java programs with no problems? Is you pass rate for CS1 high? If the answer to all these questions is yes, then this is not the session for you. During the last year I began using the Course Technology text, *A Guide to Working with Visual Logic* by Thad Crews and Chip Murphy in my CS1 Java class. This presentation will discuss what I did, how I did it, lessons learned, and the results of my year long experiment.

What's so Functional About Functional Programming?

Ken R. Adcock, Jr.

UPS

Over the last few years, the term functional programming has appeared often in the technical literature read by many software professionals. Functional programming languages have lived a relatively quiet existence mostly in the world of academia for decades whereas object-oriented programming languages underlie the dominant constructs for software development. Until recently, many people who work with mainstream object-oriented languages such as Java, C#, or C++ have never heard the term functional programming and wonder about all the sudden excitement and interest.

With the promotion of F# by Microsoft from an internal project inside Microsoft Research to a first class .NET language and the development of JVM-based languages such as Scala and Clojure, industry is indeed taking notice. Furthermore, with multicore processors now common, the increased focus on concurrency and parallel programming has caused many to investigate functional programming languages because they seem well-suited for that task. Finally, one cannot overlook the desire for improved productivity and language expressiveness.

The presenter makes the assertion that the idea of functional programming is often read about, but not always well-understood. Furthermore, the presenter makes the further assertion that instead of focusing on one particular language, understanding is best achieved by first learning about the key concepts that provide the foundation for several languages. Finally, the purpose of this presentation is to provide the audience from a more traditional background in object-oriented languages with an introduction to functional programming and the characteristics that make it useful.

Ten Things Every Graduate Student Should Know.

R. Phillip Bording

Alabama A&M University

The toolkit for new graduate students should include following, LaTeX for writing, Linux expertise, make files, skill in finding and installing open source software, animations for visual presentations, good and practiced speaking skills, script writing, parallel computing with MPI, code migration skills and introduction to the art of classroom teaching. This talk will explore these top ten things graduate students should know. Demonstrations will be provided for the above topics so that graduate students will want to learn them and then can use them as effective tools in their developing research and educational processes. Technical writing and thesis writing tools need to match the professional level requirements of the ACM, IEEE, and other computer societies. Linux is now pervasive, and graduate students should be able to build and set up Linux machines from scratch. Graduate courses should require student poster and paper sessions, using and developing skills in technical presentations. The hardware world is now parallel and so should students.

Creating iPhone Apps With C# Using Novel's MonoTouch

Bob Bradley

University of Tennessee - Martin

Creating iPhone apps is a hot topic today. But many aspects of using Apple's official development system and language of choice (X-Code and Objective-C) seem like a major step backwards. Lack of garbage collection, lack of robust string and networking libraries, a large learning curve, all those floating windows, non-descriptive plus/minus symbols, etc. are only a few reasons to dislike the Apple way of development. (And don't get me started on Interface Builder!)

Is it possible create Apple iPhone apps and to still have all of the niceties of C# and Visual Studio that Microsoft has spoiled us with? Can I have my cake and eat it too? Thanks to Novell, the answer is yes. But it will cost you, and you may get a little fat doing it! In this presentation, we will talk about the advantages and disadvantages of programming the iPhone using in C# using Novel's MonoTouch software. And if time allows, we will also talk about their plans to have C# on the Android phones as well!

Notes



Conference at a Glance



	Azalea	Dogwood I
7:30 AM	Morning Coffee–Poolside	
8:00 AM	Welcome and Keynote Address	
9:00 AM	Coffee Break–Poolside	
	Session I–Masters	Session I–Undergraduate 4
	Chair: Adcock	Chair: M. Wiggins
9:15 AM	Pitts	Behar
9:35 AM	Flores	Tesar
9:55 AM	Chasteen	Bohra, Hearn, Hodges, et al
10:15 AM	Dye	Zeiger
	Session II–Masters	Session II–Undergraduate 4
	Chair: Crowell	Chair: Smithfield
10:40 AM	Olmstead	Sardinas
11:00 AM	Tzanis, Osibote	Ali
11:20 AM	McMeen	Walling, Kawell
11:40 AM	Stites	Hill
12:00 PM	Lunch–Patio Restaurant	
	Session III–Masters	Session III–Undergraduate 4
	Chair: Nicholson	Chair: Harris
1:00 PM	Durand	Smith
1:20 PM	Aderholdt	Moore
1:40 PM	Stewart	Christensen, Phillips
2:00 PM	Derveloy	Burton
2:20 PM	Break–Poolside	
	Session IV– Masters/UG 2	Session IV– Undergraduate 4
	Chair: Nicholson	Chair: Summers
2:35 PM	Fletcher	Weston, Hollomon
2:55 PM	Gasior, McNeely, Davidoff	Loewen, Weston
3:15 PM	Alston, Bozarth, Santiago, Odems	Baldwin
3:35 PM	Jewett, Thompson, et al	McGarth
5:00 PM	Business Meeting–Magnolia	
7:00 PM	Awards Banquet–Azalea	

	Dogwood II	Magnolia	Highlander
7:30 AM	Morning Coffee–Poolside		
	Welcome and Keynote Address		
9:00 AM	Coffee Break–Poolside		
	Session I–Doctoral	Session I–Professional	Session I–Professional
	Chair: Johnson	Chair: Clark	Chair: Ghanbari
9:15 AM	Rao	Summers	Rickard
9:35 AM	Gurupur	Jackson	Ey
9:55 AM	Liu	H. Li	Hooper, Crowell
10:15 AM	Sapkota	Britton	Purewal
	Session II–Doctoral	Session II– Professional	Session II– Professional
	Chair: Winters	Chair: Britton	Chair: Clark
10:40 AM	Gao	Ghanbari	Smith, Price
11:00 AM	Ross	Nicholson	Krishnaprasad
11:20 AM	Halder	Walker	Munger, Anderson
11:40 AM	Britt	Rath, Parker	C. Li
12:00 PM	Lunch–Patio Restaurant		
	Session III–Undergraduate 4	Session III– Professional	Session III– Professional
	Chair: Stamey	Chair: Bosworth	Chair: Britton
1:00 PM	Kazerouni, Padgett, Shrewsbury	Bossie	J. Li
1:20 PM	Stolper	Ray	Orsega
1:40 PM	Heidorn	Liang	Pfeiffer
2:00 PM	Akujuobi, Coleman, Fowler	Brown, Ey	Dong
2:20 PM	Break–Poolside		
	Session IV–Undergraduate 4	Session IV– Professional	
	Chair: Chowdhury	Chair: Bosworth	
2:35 PM	Waynesboro	Winters	
2:55 PM	Taylor	Adcock, Jr.	
3:15 PM	Obando, Smith	Bording	
3:35 PM	Thompson	Bradley	
5:00 PM	Business Meeting–Magnolia		
7:00 PM	Awards Banquet–Azalea		

Glenstone Floor Plan

