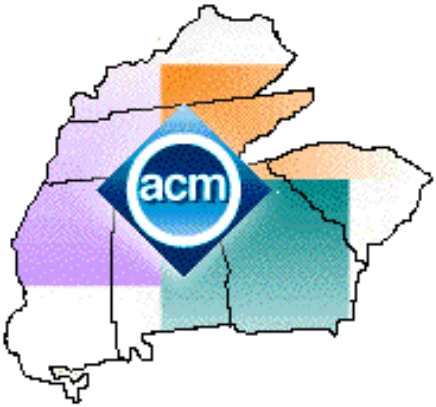
Fall Conference Proceedings

Mid-Southeast Chapter

of the ACM

Gatlinburg, Tennessee
Nov. 13-14, 2014

Mid-Southeast Chapter



of the ACM

For information on the 2015 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.

Table of Contents

Message from the Chapter Chair

Welcome to the 2014 Fall Conference of the Mid-Southeast Chapter of the Association for Computing Machinery. On behalf of the officers and members of the ACM Mid-Southeast Chapter, I welcome you to the 56th annual gathering in scenic Gatlinburg, Tennessee.

What an exciting time to be in the field of computer science. So many new technologies are being developed at such a rapid pace. Cloud computing, mobile computing, robotics and artificial intelligence are just a few of the hot areas of research and development that many faculty and students are involved in today. Our conference has always shined as a great place for students at all levels of higher education to have an opportunity to present some fascinating research and also to allow them to develop their presentation skills. These skills are much needed in our field to help communicate these new ideas to the ever growing and varied end users of the technologies we develop.

This year we will also be challenged by our keynote speaker, Dr. Jeff Gray, to reach out to the k-12 community to help inspire the next generation of computer scientists. As our field continues to grow we are going to need to recruit at an early age new people to come and join us in our research. There is a rapidly growing gap between CS students in higher education and the number of CS jobs. Some say the gap in the next five years may be as high as a million jobs without employees with the education to fill them. We not only can help ourselves to find future students to fill the research gap, but we can help k-12 students discover a field they never thought was right for them.

As always I cannot thank enough the chapter board and committee and the work they have put in to make this conference a success. Long hours in the past few months come to bear fruit in these two days. Scheduling all the speakers, judges, and session chairs is a real game of chess. Keeping track of the website and finances takes the work of many people. I thank each and every person who has stepped up and volunteered to make this conference what it is.

We hope you will enjoy this conference and also that you will get out and enjoy the beautiful Gatlinburg area. Thanks for coming and participating.

Greg Kawell – Samford University

Chapter Officers

Chair
Greg Kawell
Samford University
gakawell@samford.edu

Vice Chair
Kathy Winters
University of Tennessee at Chattanooga
kathy-winters@utc.edu

Secretary
Melissa Wiggins
Mississippi College
mwiggins@mc.edu

Treasurer
Bob Bradley
University of Tennessee–Martin
bbradley@utm.edu

Webmaster
Bob Bradley
University of Tennessee–Martin
bbradley@utm.edu

Conference Committee

Conference Chair
Kathy Winters
University of Tennessee at Chattanooga
kathy-winters@utc.edu

Program Chair
Kathy Winters
University of Tennessee at Chattanooga
kathy-winters@utc.edu

Student Paper Competition
Brian Toone
Samford University
brtoone@samford.edu

Hospitality Suite
June West
Spartanburg Community College
westj@sccsc.edu

Kathy Winters
University of Tennessee—Chattanooga
kathy-winters@utc.edu

Student Paper Competition Judges

Chair

Brian Toone, *Samford University*

Undergraduate 2-year

Hoda Mehrpouyan, *Columbus State University*
Trang Nguyen, *Columbus State University*

Undergraduate 4-year

Greg Kawell, *Samford University*
Bob Bradley, *University of Tennessee at Martin*
June West, Spartanburg Community College
Kathy Winters, *University of Tennessee at Chattanooga*
Jonathan Tew, *Columbus State University*
Arlene Perkins, *University of Southern Mississippi*
Radhouane Chouchane, *Columbus State University*
Britni Alexander, *Columbus State University*
Lydia Ray, *Columbus State University*

Masters

Jackie Thompson, *University of Tennessee at Chattanooga*
Cenchutta Jackson, *Austin Peay State Univeristy*
Jeffrey Galloway, *University of Alabama*
William Johnson, *Georgia Perimeter College*

Doctoral

Melissa Wiggins, *Mississippi College*
Joe Dumas, *University of Tennessee at Chattanooga*

Session Chairs

Azalea

Session I:	Joe Dumas
Session II:	Jack Thompson
Session III:	Jack Thompson
Session IV:	June West

Dogwood I

Session I:	Michael Galloway
Session II:	June West
Session III:	Hoda Mehrpouyan
Session IV:	Hoda Mehrpouyan

Dogwood II

Session I:	Britni Alexander
Session II:	Britni Alexander
Session III:	Kathy Winters
Session IV:	Kathy Winters

Highlander I

Session I:	Ken Adcock
Session II:	Ken Adcock
Session III:	Greg Kawell
Session IV:	Greg Kawell

Highlander II

Session I:	Denise Williams
Session II:	Denise Williams
Session III:	Bob Bradley
Session IV:	No session

Notes

ACM Mid-Southeast Chapter
2014 Fall Conference
Gatlinburg, Tennessee
Glenstone Lodge

Thursday, November 13, 2014

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 14, 2014

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: **Doctoral Degree Presentations**
Session Chair: Joe Dumas

9:15 – 9:35 *A Greedy Algorithm to Determine the Longest Suffix Prefix Overlap of two DNA Strings* - Natarajan Meghanathan - Jackson State University

9:35 – 9:55 *A Local Spectrum Knowledge-based Routing Protocol for Cognitive Radio Ad hoc Networks* - Natarajan Meghanathan - Jackson State University

9:55 – 10:15 *Contextion: A Framework for Developing Mobile Context-Aware Applications* - Elizabeth Williams - University of Alabama

10:15 –10:35 *Distributed Learning For Polytope Artmap In The Framework Of Structural Risk Minimization* - Xinpeng Liao - University of Alabama - Birmingham

Dogwood I: **Undergraduate 4 Year Degree Presentations**
Session Chair: Michael Galloway

9:15 – 9:35 *Evolving Neural Architectures That Respond to Multiple Stimuli* - Jared Nelsen - Samford University

9:35 – 9:55 *Behavioral Artificial Intelligence and Real-Time Systems Integrated with Slot Cars* - Ellis Hicks - University of South Alabama

9:55 – 10:15 *Augmented Reality in Mobile Development* - Greg Edison - Clemson University

10:15 –10:35 *Improving Authorship Attribution Methods Using Compiler Information* - Braden Groom and Peter Pirkelbauer - University of Alabama – Birmingham

Dogwood II: **Master's Degree Presentations**
Session Chair: Britni Alexander

9:15 – 9:35 *An agent-based framework for constructing decision support systems for the U.S. Army's Training Support System (TSS)* - Andrew Dugger and Hoda Mehrpouyan - Columbus State University

9:35 – 9:55 *Voice Morphing Using Artificial Neural Networks* - Tim Ojo and Yu Liang - University of Tennessee – Chattanooga

9:55 – 10:15 *An Agent-based Mathematical Model about Carp Aggregation* - Chao Wu and Yu Liang - University of Tennessee - Chattanooga

10:15 –10:35 *Energy-aware Multipath Provisioning in Wireless Mesh Networks* - Jesse Whitehead - University of Tennessee – Chattanooga

Highlander I: **Professional Presentations**
Session Chair: ken Adcock

9:15 – 9:35 *Post-mortem email analysis of the website chair for ICSE 2014* - Brian Toone - Samford University

9:35 – 9:55 *Virtual Worlds And Conservational Channel Evolution And Pollutant Transport Systems (Concepts)* - Chenchutta Jackson - Austin Peay State University

9:55 – 10:15 *Programming Across the Science Curriculum* - David Frazier and Hannah Leverentz - Tusculum College

10:15 –10:35 *Exploring SAP ERPsim in the Business Curriculum: Transforming Management Information Systems at East Tennessee State University* - Stephen Hendrix - East Tennessee State University

Highlander II: **Professional Presentations**
Session Chair: Denise Williams

9:15 – 9:35 *MOCS, An NSF-funded study to improve the percentage of computer science and computer engineering majors who obtain four-year degrees from colleges and universities.* - Jack Thompson - University of Tennessee - Chattanooga

9:35 – 9:55 *Efforts to Increase Retention in an Undergraduate Computer Science Program* - Joshua T. Guerin and Bob Bradley - University of Tennessee - Martin

9:55 – 10:15 *A High School Project Clarifying the Scientific Computing Paradigm* - A. Louise Perkins - University of Southern Mississippi

10:15 –10:35 *Hidden Curricula in Computer Science* - William Hooper and Joyce Crowell - Belmont University

Session II: 10:40 – 12:00 p.m.

Azalea: **Master's Degree Presentations**
Session Chair: Jackie Thompson

10:40 – 11:00 *Intelligent Augmented Reality Serious Game for Mobile Platforms* - Hillary Fleenor - Advisor: Rania Hodhod - Columbus State University

11:00 – 11:20 *Exploring RFID Technology for An Environmental Learning Center* - Jonathan Tew, Nicolas Polhamus, and Robert King - Columbus State University

11:20 – 11:40 *Building A Vertical Cloud* - Travis Brummett - Western Kentucky Unversity

11:20 – 11:40 *Using Unrestricted Mobile Sensors to Infer Tapped and Traced User Inputs* - Trang Nguyen - Columbus State University

Dogwood I: **Undergraduate 4 Year Degree Presentations**
Session Chair: June West

10:40 – 11:00 *Park Parrot* - Keelan Carpenter, Stuart French, and Hooper Kincannon - University of Tennessee – Chattanooga

11:00 – 11:20 *GoCab* - Dhafer al Bishi, Abdullah al Khaldi, and Abdulaziz al Qahtani - University of Tennessee – Martin

11:20 – 11:40 *Utilizing Bash Scripting and Makefiles to Simplify the Compilation Process for Programming Languages* - Matthew Jallouk - University of Tennessee – Chattanooga

11:40 – 12:00 *Helping the Help Desk*- Josh Thomas, Aaron Redden, and Bradley Moss - University of Tennessee – Martin

Dogwood II: **Undergraduate 4 Year Degree Presentations**
Session Chair: Britni Alexander

10:40 – 11:00 *WYSIWEB* - Kevin Bay - University of Tennessee – Martin

11:00 – 11:20 *Performance Comparison of Hubs and Switches in a Small LAN*- Blake Carter - Fort Valley State University

11:20 – 11:40 *Virtualization for Desktop Computers, Pros and Cons* - Bradley McKinnon- Fort Valley State University

11:40 – 12:00 *Adaptive Scheduling of a Real-Time Railroad System Using Lego Mindstorms Hardware*- Alexander Henderson and Jacob Maynard - University of South Alabama

Highlander I: **Professional Presentations**
Session Chair: Ken Adcock

10:40 – 11:00	*A Brief Introduction to Data Science* - Ken R. Adcock, Jr. - UPS
11:00 – 11:20	*DPSL - A Database Privilege Specification Language* - David Frazier - Tusculum College
11:20 – 11:40	*A Dynamic Software Development Cycle* - A. Louise Perkins - University of Southern Mississippi
11:40 – 12:00	*Cocos2D-JS - One SDK to Rule Them All* - Bob Bradley and Kurt Wesner - University of Tennessee – Martin

Highlander II: **Professional Presentations**
Session Chair: Denise Williams

10:40 – 11:00	*The Reality of Using Visual Technologies in CS1* - Kellie Price and Suzanne Smith - East Tennessee State University
11:00 – 11:20	*Improving the odds of success in Computer Science 1 (version 2.0): Adding Computational Thinking* - Wayne Summers - Columbus State University
11:20 – 11:40	*Comparison of First Java Course Taught Online and Face to Face* - Kathy Winters- University of Tennessee - Chattanooga
11:40 – 12:00	*Developing Applications Using Microprocessors to Supplement Undergraduate Computer Programming Laboratories* - Masoud Naghedolfeizi, Sanjeev Arora, Nabil Yousif, and Xiangyan Zeng - Fort Valley State University

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

Session III 1:00 – 2:20 p.m.

Azalea: **Master's Degree Presentations and Poster Session**
Session Chair: Jackie Thompson

1:00 - 1:20 *Zero Knowledge-based Trust Propagation in Airborne Networks Using Matrix Factorization* - Li Dai and Joseph M. Kizza - University of Tennessee - Chattanooga

1:20 - 1:40 *Task Simulator with Respect to Quality* - Robert Beverly - Western Kentucky University

1:40 - 2:20 **Poster Session**:
Integrating ASP-based Planning and Diagnosis with POMDPs for Knowledge Representation and Reasoning on Mobile Robots - Olatide Omojaro - Georgia Perimeter College
Jag-Copter and Autonomous Flight - William Holder - University of South Alabama
Real-Time Video Streaming Between Smartphones Using GENI - Dustin Howerton - University of Tennessee - Chattanooga

Dogwood I: **Undergraduate 2 Year Degree Presentations**
Session Chair: Hoda Mehrpouyan

1:00 - 1:20 *Data Analysis and Feature Selection Techniques for a Machine Learning Process to Assess Maturity in Cotton Fibers* - Olatide Omojaro - Georgia Perimeter College

1:20 - 1:40 *Genetics algorithm for computer-generated school schedule* - Dimitar Pankov - Georgia Perimeter College

1:40 - 2:00 *Elsa Illustrated: A Dynamic and Static Perspective on Neural Network Design* - Rob Townsend - Georgia Perimeter College

2:00 - 2:20 *Daedalus: The Internet-Capable Quadcopter* - Tyler Flynn and Joseph Sadler - Georgia Perimeter College

Dogwood II: **Undergraduate 4-year Presentations**
Session Chair: Kathy Winters

1:00 - 1:20 *Applying Traditional Malware Detection Methods to Detect Metamorphic, Mobile Android Malware* - Jaccob Mobbs and Radhouane Chouchane - Columbus State University

1:20 - 1:40 *Cybersecurity in the modern world*- Rotimi Olotu, Darryl Jackson, and Darnell Hurt - Clayton State University

1:40 - 2:00 *Using A Lexicon to Detect Cyberbullying* - Alexandria Causey - Talladega College

Highlander I:	**Professional Presentations** Session Chair: Greg Kawell
1:00 - 1:20	*Applications of Virtualization in Information Technology (IT) Systems* - Gary Miller and Masoud Naghedolfeizi - Fort Valley State University
1:20 - 1:40	*Characteristics and Scheduling Issues of Magnetic Hard Disks and Solid-State Disks* - Srinivasarao Krishnaprasad - Jacksonville State University
1:40 - 2:00	*Boolean Satisfyability Encoded Using Three Valued Two State Analytic Logic* - Xiangyan Zeng, Masoud Naghedolfeizi, Sanjeev Arora, and Nabil A. Yousif - Fort Valley State University
2:00 – 2:20	*Medical Image Denoising by Anisotropic Diffusion and Independent Component Analysis* - Xiangyan Zeng, Masoud Naghedolfeizi, Sanjeev Arora, and Nabil A. Yousif - Fort Valley State University

Highlander II:	**Professional Presentations** Session Chair: Bob Bradley
1:00 - 1:20	*A Computer Architecture/Organization Team Project Assignment: Reverse Engineering the MARIE Processor* - Joseph V. Elarde - Austin Peay State University
1:20 - 1:40	*Incorporating the ARM-Based Raspberry Pi into a Computer Architecture Course* - David L. Tarnoff – East Tennessee State University
1:40 - 2:00	*Hands-on testing of students' Forensics competency using a case study of Chinese House Churches* - G. Jan Wilms - Union University
2:00 - 2:20	*On Incorporating Security Concepts into a Networking Class* - Vijay Bhuse - East Tennessee State University

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

Session IV 2:35 – 3:55 p.m.

Azalea: **Undergraduate 4-year Degree Presentations**
Session Chair: June West

2:35 - 2:55	*3-D Modeling* - Blake Snider - University of Tennessee - Martin
2:55 - 3:15	*Speed Estimation Using Computer Vision* - Matt Bowen - University of Alabama
3:15 - 3:35	*Virtual Campus Walkthrough using Oculus Rift and Microsoft Kinect* - Will Woodard - University of Tennessee - Martin
3:35 - 3:55	*UTM Campus Tour* - Logan Harber, John Russell, and Jody Wright - University of Tennessee – Martin

Dogwood I: **Undergraduate 2-year and Undergraduate 4-year Degree Presentations**
Session Chair: Hoda Mehrpouyan

2:35 - 2:55	*How BIG DATA Benefits Businesses* - Ahmed Alsammarraie - Georgia Perimeter College
2:55 - 3:15	*Interactive Visualization of Orbital Motion* - Mike Churvis - Georgia Perimeter College
3:15 - 3:35	*Bridging the Gap in Programming using Robotics* - Tony Jones, Jr. - Talladega College
3:35 - 3:55	*Voting Anomaly Analysis, a Deeper Look* - Nicholas Zayatz, David Naylor, and Adam Graham-Squire - High Point University

Dogwood II: **Undergraduate 4 Year Degree Presentations**
Session Chair: Kathy Winters

2:35 - 2:55	*The Towers of Hanoi* - Maygan Hooper , A'nita Evans , Shayla Elington, Allison Higgins, Anastasia Wilson, and Laynasia Wesley - Clayton State University
2:55 - 3:15	*The Legend of Zelda and the NullPointerException: Procedureally Generating Game Worlds Using Critical Path Algorithms* - Andrew McPherson and Joey Shiraef - University of Tennessee - Chattanooga
3:15 - 3:35	*Gaming in Unity* - Edenbur J. Richardson, Ray Rosier, and Xiangyan Xeng - Fort Valley State University
3:35 – 3:55	*World Zombienation* - Toni Belasic, Chauntrell Clay, and Brian Pipkin - University of Tennessee - Martin

Highlander I:	**Undergraduate 4 Year Degree Presentations** Session Chair: Greg Kawell
2:35 - 2:55	*Educational Perspective: Game Development in Visual Basic .NET and Java* - Paulana Hall - Fort Valley State University
2:55 - 3:15	*Developing Computer Games with HTML 5* - Samantha Brown - Fort Valley State University
3:15 - 3:35	*Crafting Tools for Video Game Development* - Colton Ramos - Western Kentucky University
3:35 – 3:55	*Local WiFi iOS Platform for Classroom Use* - Reza Moghtaderi Esfahani and Thomas Douglas - High Point University

Highlander II: **No Presentations**

4:30 – 5:00 p.m. **Business Meeting, Highlander I**

5:00 – 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. Jeff Gray
Department of Computer Science
University of Alabama

The Surge in K-12 Computer Science Education: What can you do to help?

Abstract

Much interest has emerged recently regarding the importance of K-12 Computer Science education, as noted by the national awareness and attention given to the efforts of Code.org and the "Hour of Code." Additionally, support from several National Science Foundation (NSF) programs (e.g., CE21 and STEM-C) has helped to create a pipeline of computing awareness that has culminated in a deep surge in momentum over the past year. A key to the future of K-12 CS Education is the new CS Principles course, which represents a joint effort by the College Board and NSF to revitalize the national importance of K-12 CS. Several universities and colleges are creating a similar course for non-majors – the benefits of introducing CS Principles at your own department will be summarized. As compared to the existing Advanced Placement (AP) CS exam, the CS Principles course focuses less on the very specific details of a particular programming language and, instead, concentrates on what many consider to be the fundamental principles of computing – the so-called "Big Ideas" of the CS Principles curriculum. Interest in the CS Principles curriculum is growing, with many high schools and universities beginning to offer an initial pilot course in order to prepare for the expected first exam in 2016-2017. In addition to CS Principles, there are several other curricula at the high school level (e.g., Exploring Computer Science), as well as middle school and K5, that have generated much interest. Specifically, new initiatives by Code.org to create a national network of teacher training workshops are addressing pipeline needs in K-5 and middle school. This talk will survey some of these efforts, share lessons learned from activities in Alabama, and suggest ways that you can become involved in your community with this new effort to raise awareness about computing!

About the Speaker

Jeff Gray is a Professor in the Department of Computer Science at the University of Alabama. He received a Ph.D. from Vanderbilt University and BS/MS from West Virginia University, all in Computer Science. He has attended the ACM Mid-Southeast conference as both a student and faculty advisor, and gave his first ever research talk at this conference in November 1995. Jeff's research interests are in the areas of software engineering (e.g., model-driven engineering, software modularity/evolution, and mobile computing) and topics in Computer Science Education. He has recently published on these topics in *IEEE Software, Communications of the ACM,* and *IEEE Computer*. Jeff's work has been supported by Google, IBM, DARPA, US Air Force, Department of Education, and NSF (including an NSF CAREER award). In Fall 2008, he was named the *Alabama Professor of the Year* by the Carnegie Foundation. Since 2011, he has been a national Pilot teacher for the new CS Principles AP course and is an Editor for the College Board's teaching guide on CS Principles. He serves on the Education Advisory Council of Code.org and is an affiliate instructor for Code.org's K5 teacher training courses. More information about his work can be found at http://gray.cs.ua.edu

Student Abstracts
Undergraduate Two Year Programs

Data Analysis and Feature Selection Techniques for a Machine Learning Process to Assess Maturity in Cotton Fibers

Olatide Omojaro
Georgia Perimeter College

As world leaders in cotton production, the United States contributes to more than 40% of the world's total exports. Cotton is primarily used by the textile industry for manufacturing products such as clothing and home furnishings, which demand higher quality fibers. Among the physical characteristics of cotton fibers, maturity is one of the most important. In a prior work, a system was devised to measure maturity using longitudinal images of individual cotton fibers. Here, we add a feature selection strategy that uses a transfer learning process to evaluate the suitability of a strategically selected subset of target domain features. The source domain is defined as the two features of interest from the current reference method a cross-sectional view of a cotton fiber measured with a microscope. The target domain is defined as the thirteen features - nine standard features and four Haralick texture features measured from longitudinal images acquired by a line-scan camera. The adapted framework provides an optimal subset of target features to best assess the maturity of cotton fibers.

Genetics algorithm for computer-generated school schedule

Dimitar Pankov
Georgia Perimater College

All classes are being entered in the system. All constraints are being entered in the system (ex: when can a certain professor work; some class should be held in a specific room, etc.). Then a genetics algorithm is initiated over the input data and it arranges the classes in ways that it tries to make sure there are no conflicts (conflict will be an unmet constraint rule; overlapping, etc.). Finally, when done the algorithm will present the data in a user-friendly way, that will allow the user to view and change the result, if desired. The genetics algorithm creates a pool of initial "specimens". Then the best (those who match most rules) are selected and then crossed over with others and also mutated where needed. This way a new generation is produced. The benefits of a genetics algorithm to the sequential and conditional ones is that it produces its own cases and thus has to do fewer checks, which results in (exponentially) reduced computational time. The user interface part supports creation of class, professor and room objects, along side the handy drag and drop feature that will allow the user to, if needed, easily rearrange the schedule, after the generics algorithm has finished.

Integrating ASP-based Planning and Diagnosis with POMDPs for Knowledge Representation and Reasoning on Mobile Robots

Olatide Omojaro
Georgia Perimeter College

Mobile robots operating in real-world domains frequently encounter challenges due to an uncertain and dynamic environment. In order for a robot to successfully accomplish a given task, it must not only generate an effective plan, but also deal with unforeseen changes in the working environment and action outcomes that may be non-deterministic. This project adds navigational planning and diagnostic capabilities to an existing architecture that integrates high-level logical inference with low-level probabilistic decision making. Answer Set Programming (ASP), a non-monotonic logic programming paradigm, is used to represent and reason about domain knowledge, while Partially Observable Markov Decision Processes (POMDPs) are used to probabilistically model the uncertainty in sensing and acting on robots. The modified architecture enables robots to represent and reason with incomplete domain knowledge, adapting sensing and acting to the tasks at hand, and revising existing knowledge based on information extracted from sensors and humans. This architecture is evaluated in simulation and implemented on a wheeled robot in an indoor domain.

This project also investigates the design and use of a mobile robot (and the architecture described above) in the high-throughput phenotyping domain. To support precise navigation of the robot and the measurement of characteristics of individual plants in the field, sensors such as an RTK GPS and LIDAR are explored.

Elsa Illustrated: A Dynamic and Static Perspective on Neural Network Design

Rob Townsend
Georgia Perimater College

In recent years, the field of artificial intelligence has made great achievements with the use of neural networks. Although once considered incapable of nontrivial problems, their use is now widespread.

In the design of such systems, deciding whether to emphasize speed or extensibility is becoming increasingly important. For example, large scale systems often work on a variety of problems, so they must allow for the growth of new neural connections. Just as a human brain develops throughout childhood and beyond, these systems must encompass ever wider and more complex situations.

However, some smaller, more specialized neural networks will require optimizations for the speed of calculations. Path-finding algorithms may fall in this category. They often have little need for extensibility, but ideally display real-time performance.

This project focuses on these tradeoffs and consequences through the design of a back-propagating neural network, elsa. Written in C, it was originally intended to control a robotic navigation system. Its structure used doubly linked lists for representing both the network, and the connections, or weights, of each connection. This made it very easily extensible, although too slow for its intended purpose. For this reason, it was restructured using arrays to model all the needed data, including the weights and the network itself.

Both designs were tested on multiple architectures, from modern laptops to single board computers found in certain robots. Although still displaying exponential growth, the system using arrays performed significantly faster in all cases. This appears to confirm the need for application-specific customizations in problems solved by neural networks.

Daedalus: The Internet-Capable Quadcopter

Tyler Flynn and Joseph Sadler
Georgia Perimater College

Last year, Amazon founder and CEO Jeff Bezos revealed plans to offer package delivery in less than thirty minutes using unmanned aerial vehicles. Since then, multi-rotor aircraft have received unprecedented news coverage. Multi-rotors have also been recently adopted by the film industry to capture previously impossible shots, including some at the Sochi 2014 Winter Olympics. These vehicles fall under the broader category of helicopters, as lift is supplied by horizontally revolving overhead rotors.

Commercially available drones such as these are conventionally operated by remote, using a close proximity radio point-to-point link. It is also important to note that pilots maintain a line-of-sight visual on the drone. For these aircraft to be practical in applications like that of Amazon, in which flight will be largely automated and over long distances, multi-rotors require a fundamental change in their control systems for both efficient and safe operation.

The Daedalus project presents a solution to these problems. It is an Internet-capable quadcopter (four rotor multi-rotor) developed with innovative control and safety mechanisms. The control system consists of an Android phone mounted on the chassis of the quadcopter, a serial servo controller, and a separate flight module. The phone is running an Internet-facing SSH (Secure Shell) server, which can be securely accessed from any other Internet device that is authenticated using shared key pairs. The need for proximity is thereby eliminated. The remote operator can run bash scripts on the phone, which in turn sends serial commands to the servo controller. This device then translates the serial command to the corresponding PWM (Pulse Width Modulation) signal for the flight module to actuate the proper rotor movement. Due to the local storage of the scripts, the quadcopter is able to both remain in operation despite intermittent interruptions in connection and function on an offline schedule.

How BIG DATA Benefits Businesses

Ahmed Alsammarraie
Georgia Perimater College

As fascinating as technology can be, from Internet to mobile apps to video games for youngsters, businesses both big and small can greatly benefit from Big Data. It is massive sets of data that are utilized by large organizations, such as Google, Facebook, EBay and more, to process varies business tasks, to ease the business operations. Big Data is more of a buzzword (as Business Insider stated) that describes very large data; both structured and unstructured.

The problem is that while some large firms have made their transition to utilization of big data in their firms, many companies have not yet adopted to new storage technologies as well as developed methods that would best fit their firms. Ultimately, companies that do not use Big Data will loose a competitive edge as utilization can save tremendous amount of money, allow companies to operate with higher speed, analyze customers faster and with higher efficiency. According to the SAS website, United Parcel Service (UPS) is able to track 16.3 million packages daily from over 8 million clients. Moreover, UPS includes telematics in over 46,000 vehicles and successfully tracks such meticulous details as speed, direction, and drive performance all with the help of Big Data.

Big Data concepts can translate to big businesses and also small which drives our economy. For Example, catering companies could utilize Big Data concepts for day-to-day operations, including table reservations and precise servers timers. The meticulous details of the food industry could be measured and calculated with the help of Big Data. Success of any company lies in an ability to manage to small levels of detail, and Big Data does just that. All in all, Big Data integration by businesses is consequential and it is what can better businesses around the globe.

Interactive Visualization of Orbital Motion

Mike Churvis
Georgia Perimeter College

The pedagogy of astrophysics has historically involved a combination of lecture and formulae with scattered use of static visuals. This method of teaching seldom engages any but the most mathematically minded, as has been discovered anecdotally and confirmed through survey.

I am developing computer application provides a new avenue of student engagement for astrophysics instructors. Its current functions are as follows:
- Provides a realistic visualization of the orbit of a celestial body as observed from Earth
- Lets the user manipulate the orbital parameters of the body to fit a curve (generated using data from a real star)
- PLANNED FEATURE: Once the user has fit the virtual orbit to the real data's curve (to a specified degree of accuracy), the user may view the orbit from any angle to better grasp the data by its "look and feel".
- PLANNED FEATURE: Lets the user approximate the position of a planet(oid) by fitting its parent body's orbital perturbance curve to radial velocity data from a real star

Written in HTML5 and Javascript and run entirely through a modern browser (i.e. Google Chrome), this app can be deployed to an instructor's website with ease and accessed by any number of students anywhere.

The general principle on which the app is being developed is that by enhancing the way people visualize the sciences one can bring greater audiences to science at large.

Student Abstracts
Undergraduate Four-Year Programs

Evolving Neural Architectures That Respond to Multiple Stimuli

Jared Nelsen
Samford University

Our system to evolve neural architectures via a genetic algorithm raises several key questions about how neural systems, and thus biological organisms, respond to stimuli. The focus of our recent research has been searching for evolutionary pathways to complexity. One of our main lines of attack is to demonstrate how a neural architecture could be evolved to respond to more than one distinct stimuli in the absence of lifetime learning, that is, based solely on genetic learning. In the biological world and hence in our simulations this task is complicated because the phenotype is typically under-specified by the genome. We explore this intermediate evolutionary step (which is assumed to precede traditional weight modification activities) by simulating the evolution of organisms comprised of neural architectures able to operate appendages in order to move themselves in several distinct manners.

Behavioral Artificial Intelligence and Real-Time Systems Integrated with Slot Cars

Ellis Hicks
University of South Alabama

The field of Computer Science includes many research focus areas. Two areas of interest that often impact broader systems are those of Artificial Intelligence (AI) and Real-Time systems (RTS). AI is often described as the creation of an algorithmic or computation process that allows a computer to perceive, reason, and act. A RTS is a system that must provide an effective and correct response while meeting a timed deadline. The simple platform of a slot car race track is employed in order to demonstrate these principles of AI and RTS. In this environment, a variety of sensors are deployed around the track to monitor the location of the cars as well as modify behaviors. A robotic gripper is built and used to control the speed and performance of the car. This allows for the system to be fully automated without the need for human interaction. The control algorithm will use the data collected to intelligently and efficiently control the cars behavior. To this end, the implementation of passive and aggressive control algorithms is robust in such a way that cars can change behaviors on the instantly without causing the systems to stop running. Ultimately, the system is a robust look at AI behavioral patterns that provides an in-depth look at what AI routines can do in regards to a semi-practical situation. The extension of our research goes into discussion on the possibility of application in services such as traffic control and automated cars and how those systems can be implemented effectively.

Augmented Reality in Mobile Development

Greg Edison
Clemson University

Augmented reality is a fast growing field in Computer Science, especially in mobile development where smart phones bring a vast array of location, orientation, and visual sensors to the table. The purpose of this project is to use this generated data to display 3D objects at specific GPS locations on the user's screen. The project has had two main challenges: (1) rendering the 3D model and (2) placing it on the screen relative to the user's position.

Models are made up of thousands of polygons, interconnected to form our favorite aliens, orcs, and destructible cityscapes. Because of this, a 3D object can be represented as a list of vertices. Once parsed these lists allow for a model to be created fairly easily in OpenGL ES, a graphics API. Further enhancements such as lighting, color, and texture can added much the same way, first by attributing the additional data to a vertex, and then sending it through OpenGL.

The second part of the project, placing the 3D model accurately on the screen, is more complicated. The process of rendering a model is akin to creating a virtual world inside your phone. And what you see of this world is determined by an imaginary camera inside of it. So in order to accurately render an object at a GPS location the camera in the virtual world and the device's camera have to match up. This is where all the data that modern phones are able to collect comes into play. Accurate GPS coordinates allow you to calculate bearing and distance, and other sensors like the gyroscope, magnetic sensor, and gravity sensor allow you to determine orientation. All of which lets me see the Eiffel Tower in the back parking lot of my apartment complex.

Improving Authorship Attribution Methods Using Compiler Information

Braden Groom and Peter Pirkelbauer
University of Alabama - Birmingham

Authorship attribution techniques are important for tackling many problems, such as plagiarism detection, copyright infringement, and malware source analysis. Source code styles vary among programmers in systematic ways. This variation can be in the format of the code, variable names, delimiter formatting, specific coding techniques, code comment text, or specific coding styles (for example, the "Hungarian notation").

Currently popular methods rely on n-gram based techniques. While such techniques are programming language oblivious, they miss a host of useful information that is present in source code and characterize important implementation choices. Other methods use lexers to produce a token stream from the input code, or style checkers that use superficial characteristics, such as brace position and indentation. These approaches are insufficient for extracting detailed information from code. For example, the information that a name belongs to a variable and not a function or class is often lost.

Our approach, in contrast, is based on available compiler technology. This allows us to extract more precise information from source code than other tools can. One such method measures to what extent a piece of imperative code exhibits functional characteristics. We can ask questions such as how many assignments were made to a single variable? In addition, we can extract the names of variables, functions, and user defined types. The use of a compiler allows us to group each name in a separate category. In addition, we also extract strings and comments. String and comments can be processed with available authorship analysis techniques. All extracted features are grouped in different sets that are fed into a machine learning tool. Based on an available software corpus the machine learning tool identifies a feature set weighting with high discriminatory power. We will present an overview on our feature extraction implementation based on the ROSE compiler, and our use of WEKA to identify good classifier.

To train the machine learning tool and validate our approach, we collected a software corpus from Github. The corpus consists of single authored projects that have at least X commits. An overview of the collection method will be given. We will discuss our results and compare our approach with other existing techniques.

Park Parrot

Keelan Carpenter, Stuart French, and Hooper Kincannon

University of Tennessee - Chattanooga

Park Parrot is a software solution being developed to fulfill downtown parking needs for two groups of users. First, it helps parking lot owners optimize their profits generated by the parking lots and give them statistics on the lots they own. The second need it fulfills is helping people looking for a place to park toward available parking spots before arriving at their destination, specifically to the lots owned by users of the Park Parrot Service. Park Parrot works by using sensors to detect if each spot within a parking lot is available. These sensors relay this information to a server which is accessible to the owner and the customer. The parking lot owner would access stored information from the server via any device with a web-browser. The website for the lot owner user will be able to see live information on all of the lots that they own as well as stored information, such as parking lot statistics from last month. The website will also be able to generate reports based on parameters set by the parking lot owner users. Meanwhile, people searching for a parking spot will be able to access the server via web-browsers and mobile applications. These users will only be able to view the availability of all parking spots in a given radius and receive directions to that spot based on the parking lot location and the GPS based location of their mobile device. The data, both live and stored statistics, will be kept on the server using MongoDB. The data will be accessible via Node.js and called within websites specific to each type of user.

GoCab

Dhafer al Bishi, Abdullah al Khaldi, and Abdulaziz al Qahtani

University of Tennessee – Martin

This is a project that aims at efficient management of resources of a cab company through localization. The project allows the customer to book a cab using just the mobile application. Based on the customer's location, the nearest cab will be allocated automatically by the server in the field which will not only allow efficient resource management of cabs and fuel management, but will also save time by reducing drivers' travel and by informing the customer about the ETA and the estimated fare. All this is made possible by keeping live tracking data of cabs at server side and performing all the operations in real time.

Utilizing Bash Scripting and Makefiles to Simplify the Compilation Process for Programming Languages

Matthew Jallouk
University of Tennessee – Chattanooga

Anyone who has used the command-line interface for more than a few minutes recognizes that there are a number of commands to remember. This becomes especially noticeable when dealing with the wide variety of programming languages the world has to offer, each with its own different compiler and variety of flags utilized in compiling source code. This project attempts to simplify the compilation process of programming languages by utilizing Linux bash scripting and Makefiles. It also attempts to improve the efficiency of the typical programmer by using an overarching consistent system of which to compile any number of programming languages. The general structure of this solution is that a bash script generates the Makefiles and those Makefiles can actually be used to compile the source code of other languages (such as C++ or Java). There is also a secondary bash script that can add support for new languages. All of this together is known as the MultiCompile System (MCS), and this dynamic system allows for easy customization to support any number of languages a programmer wishes to. This in essence, attempts to effectively improve efficiency of the user and simplify the compilation process of programming languages.

Helping the Help Desk

Josh Thomas, Aaron Redden, and Bradley Moss
University of Tennessee – Martin

A common occurrence when working with information technology is helping users solve their computer issues, big or small, such as registering a system for accessing the campus network, requiring either a wireless MAC address, or an IP address from the computer to be registered. For the typical user finding this information can be nearly impossible (or so they say). We provide a web application allowing a user to obtain information about a system including the MAC address, IP address, operating system, RAM, and more.

WYSIWEB

Kevin Bay
University of Tennessee – Martin

Designing a great-looking website and coding its framework are two closely related overlapping goals requiring vastly different non-overlapping skillsets. Tools designed to bridge this gap have traditionally produced obfuscated, invalid code with little semantic value. WYSIWEB seeks to remedy this by giving designers an intuitive WYSIWYG working environment geared toward producing semantically correct, valid code within accessibility guidelines. WYSIWEB is built to create responsive, modern websites while leveraging the optimum libraries for solving common problems in a pre-packaged format without requiring designers to "get their hands dirty" with the code.

Performance Comparison of Hubs and Switches in a Small LAN

Blake Carter
Fort Valley State University

The purpose of this research project was to compare the performance of hubs and switches configured into a Local Area Network (LAN) that is used mainly for heavy web browsing. Riverbed Modeler simulation software was used to evaluate the performance of hubs versus switches in small local area networks. Six different client/server LANs with varying size were designed on the software.

A network model was first designed with 5 PCs and then the number of PCs was increased by 5 for each subsequent network (up to 30 PCs). Two simulations for each network model were run - one when all PCs and the server were connected together with a hub and the other when all connected with a switch. As a result, a total of 12 simulation seniors were run.

The network performance was measured as the number of PCs was increased from 5 to 30 using a hub and then a switch. For the case of hub, the server load was proportionally increased in a linear manner as the number of PCs increased. The results also indicated that for a network size of 5, the hub performs slightly better than a switch; however, for the network size 30, the switch outperforms the hub. The reason for the first case is the address routing executed by the switch has impacted the network traffic and thereby the server load. However, for size 30, the address routing of the switch is relatively small as compare to the network traffic of 30 computers.

The results of this research indicate that for a small LAN with fewer than 5 workstations, a hub could be a better choice in terms of both performance and cost. However, for a larger LAN a switch will be definitely a better networking device.

Research Advisor: Dr. Masoud Naghedolfeizi

Virtualization for Desktop Computers, Pros and Cons

Bradley McKinnon
Fort Valley State University

Today, many businesses struggle to reduce cost, while boosting efficiency, and still managing to make a profit. Virtualization alone can help improve all three aspects of information technology in an enterprise. Virtualization is the act of creating a virtual environment of an operating system or a storage device, in order to maximize the full utilization of computing hardware systems such as servers and workstations. Virtualization can be executed on either a desktop or a server computer. This research will be reviewing virtualization capabilities on a desktop computer.

Currently, the two most popular and widely used tools for virtualization are VirtualBox (VB), and VMWare (VW) Workstation. Both run on either Windows or Linux operating systems. It should be also noted that VB is supported on Mac OS X while VW is not. Both programs support a wide range of operating systems such as: Windows, Linux, Android, and UNIX.

This research will closely compare VirtualBox and VMWare Workstation capabilities and shortcomings. With VW Workstation, you simply cannot go wrong. The user interface is so simple and easy to understand. It almost requires no prior knowledge of virtualization in order to jump right into it and grasp it. It supports features for major versions of Windows and Linux, with updated drivers included. The only drawback to Workstation is the hefty price of $250. VirtualBox cannot match the power of VmWare Workstation, but it is free and still a good way to get the core functionality of virtualization. The major difference between the two is the overall polish and user interface. VirtualBox is not as easy to navigate through, a lot of changes have to be made in order to get one of the virtualized operating systems to function properly; this includes manually updating drivers (e.g.; get the sound to function for Linux).

Research Advisor: Dr. Masoud Naghedolfeizi

Adaptive Scheduling of a Real-Time Railroad System Using Lego Mindstorms Hardware

Alexander Henderson and Jacob Maynard
University of South Alabama

A significant portion of industrial and domestic processes are automated with embedded computing systems, the programming of which must enable the system to respond to real time events with necessary speed and consistency. By focusing on the implementation of a widespread sensor network and precise scheduling in real time, we sought to develop our own embedded system. An HO scale model train was selected for its unidirectional quality and relative simplicity. A distributed network of binary sensors track the train's position and speed, sending information to the Lego Mindstorms brick for processing. This code sought to develop an algorithm that would continually calculate precise speed adjustments. Since the train's distance to its destination is always changing, the velocity equation $v = d/t$ is recalculated at every sensor to determine if the train's current velocity matches the velocity necessary to arrive at exactly the given time (neither early nor late). For the most part, this system is a reactionary setup, but a predictive algorithm was used to give the train an initial velocity to begin the trip. The greatest constraint on the success of such an experiment has always been the hardware performance. Consequently, our algorithm contains many fixes to overcome the imprecision of the Lego hardware. Toward the end of the experiment, we also implemented a physical solution to this problem, adding a turnout to the track which before was a simple loop. This allowed us to incorporate decision algorithms to minimize strain on the physical train; by choosing one branch or the other we were able to limit extremes, whether fast or slow, in the train's operation which before caused much imprecision. Our results demonstrate the extent to which physical constraints visibly affect the system and multiple approaches to decreasing the overall error.

Jag-Copter and Autonomous Flight

William Holder
University of South Alabama

Potential has been shown in the development of autonomous flight vehicles to explore environments that are too dangerous for humans to navigate. Previous projects have shown that it is possible for an embedded system to pilot a device with minimal interference from a human operator. Expanding on this research, the goal of the Jag-Copter is to search a designated area for desired landmarks using an onboard camera, navigate to these areas dynamically when they are in scope, and create a map with their location using the images taken inflight. Testing took place in a closed environment to avoid interference from unrecognized environmental factors. In order to assess the reliability of its control, each method of movement available to Jag-Copter was tested to ensure that collisions would not occur. Currently a user is capable of flying the copter using basic radio inputs, which opens of the possibility of developing an artificial intelligence machine that can interact with sensor input and images. Further development for this project will focus on creating a stable flight that allows the vision system to gather optimal data, and creating thorough search patterns based on areas of interest.

Real-Time Video Streaming Between Smartphones Using GENI

Dustin Howerton
University of Tennessee – Chattanooga

The purpose of our project is to develop an application that allows users to stream video to others in real-time over a GENI network. A user will able to select one or more contacts from their smartphone and then live stream their camera feed directly to the smartphone of their contact(s). We will be using the services of GENI (Global Environment for Network Innovations) for this project. GENI is essentially a virtual laboratory that allows users to reserve resources such as physical or virtual machines and network hardware to build their own experimental network where they can intricately control the specifics of the network's traffic. For the purposes of this project, GENI provides us with the ability to design and implement our own network protocols as well as the necessary bandwidth to achieve the quality and reliability we need for real-time video streaming.

Applying Traditional Malware Detection Methods to Detect Metamorphic, Mobile Android Malware

Jaccob Mobbs and Radhouane Chouchane
Columbus State University

It has been reported in March of 2014 that 97% percent for mobile malware is being written for Android devices. This malware typically targets the lack of security checks in those app stores that are run by parties other than Google, which leaves users vulnerable to downloading apps that are really trojans and that may steal a user's financial and other sensitive information. Running resource-consuming malware detectors, which have a potentially large set of known signatures, is not practical for small, mobile devices which cannot rely on the constant availability of an always-on source of power, on a powerful battery, or on a large amount of storage. This consideration alone has been a major cause of concern for quite a few security researchers who have recently published a number of papers on the issue. We have surveyed these papers, industry white papers, as well as papers from the traditional malware detection literature, to identify and classify the various malware detection methods that could lend themselves well to being implemented on small Android devices. We present an outline of our survey, and single out several detection methods that have been successful at quickly and accurately detecting morphing and obfuscated malware which attempt to evade detection by shifting its shape or altering its behavior. Our empirical and theoretical study led us to conclude that such decision support procedures are better suited (than the traditional malware signature-based scanners) for the detection of mobile Android malware which has recently started imitating morphing and obfuscated malware. We will present a mathematical model of an Android app that we we are writing and that will efficiently detect a most concerning set of malicious behaviors: apps which modify themselves just to add an extra set of malicious behavior that were not present when the apps were first installed.

Cybersecurity in the modern world

Rotimi Olotu, Darryl Jackson, and Darnell Hurt
Clayton State University

How easily can your password be hacked?

We live in a world where almost everything about ourselves can be easily shared with any and everyone at any given time. Some of these aspects can be very confidential and only be desired to be shared with very distinct and select groups of people, organizations, and institutions. This makes the topic of cyber security a hotly discussed one and the threats of cyber security very real, especially considering the events that constantly plague the news and media regarding breaches in cyber security, such as hacking attempts on cloud storage services, atms, and large, widely known companies, like Sony, Ebay, and DropBox.

With the help of some sample code from ScienceBuddys.com, we have constructed a python program that can guess passwords using various methods that real-world hackers and cyber security law enforcement use. In our presentation, we will discuss what makes up a strong password versus a weak password and compare the times it takes for the constructed program to guess each password of varying strength. We will also discuss the measures that need to be undertaken to maximize the potential of complete security of a given user's data.

Using A Lexicon to Detect Cyberbullying

Alexandria Causey
Talladega College

Mobile devices, computers, and tablets have produced a method for cyberbullies to manipulate in order to extend their reach in to their victim's home. In 2009, Cyberbullying had become an unpredicted phenomenon that was birthed from the advancement of technology and it continuously a growing problem in social media. The continuous growing problem might be related to the fact that technology provides partially anonymity to its users. For instance, cyberbullies can constantly alter their identity on social media networks as long as they have a valid email address. The persistent harassment, such as being bombardment by messages filled with hatred and ill will, yields psychological and physical trauma for the victim. The purpose research developed window based application to detect cyberbullying activities on technological devices. The lexicon housed the keywords and phrases that allude to possible cyberbullying. This application is working as a pilot study to trace the phrases to identify the cyberbullies categories. In future, the mobile app will be developed by using existing infrastructure of the proposed application.

Learning Programming Online: Where You Could Start And Where You Will Go.

Christopher Hooper
Belmont University

The last few years has seen an incredible expansion in the resources available to learn programming online. Many universities, such as Harvard with edX, MITOpenCourseWare, Stanford, have opened many of their undergraduate courses to the public for free. Furthermore, companies such as Udacity and Coursera offer certificates of study in an effort to apply validity to their courses. The popular press and organizations such as the Gates Foundation have hyped these resources as replacements for traditional college courses.

Often these massively open online courses (MOOCs) are difficult for the layman with no field experience. How would a stay-at-home mother, trying to reenter the workforce, approach programming? The steep learning curve exacerbates the diversity of the computer science community, as programming becomes simultaneously more alienating and important.

This presentation will cover the value of selected online resources for the novice, the student, and the professional. The IEEC maintains a programming index of the industry's most actively referenced languages. CodeAcademy.com, KhanAcademy, CodingGame give beginner friendly introductions to JavaScript, Python, Ruby, HTML and many other languages that are prominent in the IEEC index to offer. The best places to start, however, are with foundational languages like Java, C, and C++, and sites teaching these are difficult to find online. LearnJavaTheHardWay.com and reddit.com/r/learningprogramming are good online sites to search for foundational resources. The reddit community provides feedback and advice for those starting at a blank slate. LearnJavaTheHardWay.com forces beginners to carry out repetitive exercises, which is most critical to build programming skills. I will talk about GoogleForEducation, Crunchy, Cplusplus.com, and sqlzoo.net as more advanced sites for learning area specific languages.

3-D Modeling

Blake Snider
University of Tennessee – Martin

3-D modeling is demonstrated with an application that gives the user the ability to create, write, view and alter FBX files. While creating these files, the user will simultaneously be able to view the object's node tree and make alterations to it. A panel with many useful functions is placed below the menu bar for easy access. Also, an embedded language is implemented to add an alternative method of using the program.

Speed Estimation Using Computer Vision

Matt Bowen
University of Alabama

With recent advancements in digital camera technology into standard smartphones, the opportunity to integrate computer vision into daily activities has become possible. A unique application of computer vision is ESPN's use of K-Zone during Major League Baseball broadcasts, which uses a combination of three cameras along with three computers running a sophisticated algorithm that is capable of tracking a pitch to within 2/5ths of an inch. K-Zone is used by ESPN to calculate pitch speed, identify pitch type, and graphically display pitch location. Although the sophistication of the hardware and software of K-Zone allows a high degree of accuracy, there is potential for similar results using only a smartphone.

The Mobile Video Velocity Estimation (MoVVE) project investigated the application of computer vision to support a speed-tracking app on a smartphone. This presentation will describe the design of the MoVVE software that can track the velocity of objects, such as a thrown baseball using video obtained from a mobile digital camera. MoVVE estimates the speed and tracks the location of a thrown baseball using video obtained from a typical, mobile digital camera in conjunction with OpenCV computer vision library functions that identify the baseball within the video images. MoVVE was shown to successfully detect and track the baseball with a success rate greater than 90%. Baseball velocity estimates obtained with the program were compared to those measured using a professional grade radar gun. For a test population of 112 pitches, 84% of the program's estimated velocities agreed to within 10% of the radar gun measurement, and 43% agreed to within 5%. Test pitch velocities varied from 30 mph to 60 mph with the program showing equal accuracy throughout the full range. The presentation will summarize the initial experimental results in using MoVVE.

Virtual Campus Walkthrough using Oculus Rift and Microsoft Kinect

Will Woodard
University of Tennessee – Martin

Virtual walkthroughs of buildings and venues have been in use for as long as 3-dimensional modeling has existed. They are an efficient way to portray designs in a more personal way than the standard 2 dimensional drawings, so those with less technical drawing experience can envision what a future project's final design might look like. Due to most virtual walkthroughs being directly rendered as a movie, they incorporate very little user input, and are limited to the route that the creator wishes the end user to experience. This project aims to give the user full immersion in the virtual space, by using an Oculus Rift headset for head tracking and 3D viewing. The project also aims to include Microsoft Kinect integration, for realistic environment interaction using limb tracking. The subject of this experimental walkthrough will be the Johnson Engineering and Physical Sciences Building at UT Martin, and will in time expand to a full campus walkthrough.

Advisor: Somsak Sukittanon

UTM Campus Tour

Logan Harber, John Russell, and Jody Wright
University of Tennessee – Martin

UTM Campus Tour is a mobile Android app that provides an interactive bird's eye view of a college campus to assist new students and visitors in becoming familiarized with several aspects of the university environment. For an incoming student or visitor to the university, UTM Campus Tour is a priceless tool for locating classrooms, faculty offices and contact information, parking rules and regulations, campus events, and points of interest. This application is developed using Android Studio and utilizes Google Maps.

Bridging the Gap in Programming using Robotics

Tony Jones, Jr.
Talladega College

The advances in technology have changed the scope of education throughout the years. Often times introductory computer programming courses are frustrating to both students and teachers. Pullan (2013) reported building and programming robots can provide students with a project that will be embraced as both relevant and interesting. In addition, students learn more when they are actively involved in their education. In this process students gain the opportunity to think about and apply what they are learning in different settings. The LEGO MINDSTORMS NXT 2.0 set is a tool that was used to create program modules. These three basic Learning Modules will be used as stair steppers in Talladega Colleges CS 250 Basic Programming course. Students are able to program a prebuild robot to understand the basic sequence, selection, and repetition structures.

Voting Anomaly Analysis, a Deeper Look

Nicholas Zayatz and David Naylor
High Point University

Voting theory is a branch of mathematics that studies different voting methods. It has been proved mathematically that the Instant Runoff Voting (IRV) method violates certain criteria necessary for a fair vote. One particular anomaly is a violation of the Monotonicity Criterion; a voter choosing to increase their preference for a candidate can cause that candidate to do worse overall. We analyzed real-world IRV election data on large data sets in search of monotonicity anomalies, since no such software is readily available. We wrote various programs to mimic the process of running an IRV election, swapping certain voter preferences and re-running the election to see if it affected the outcome. We also created software to compare and contrast different voting systems such as Plurality, Pairwise Comparison, and various Borda Count methods. By writing code to run each of the mentioned election types with supplied votes, we checked each system for anomalies as well as compared results for each voting method to check for differences (i.e. to find which system runs the fairest or most democratic elections). Our analysis indicates that monotonicity anomalies are rare, if present at all, in the given data, and the system of voting rarely has an impact on who gets elected.

Advisor: Adam Graham-Squire

The Towers of Hanoi

Maygan Hooper , A'nita Evans , Shayla Elington, Allison Higgins, Anastasia Wilson, and Laynasia Wesley
Clayton State University

The basis of this project was to build a robot and program it to perform a sequence without the need of commands being entered for specific tasks each time. This concept allowed us to approach the NXT EV3 with the idea of creating an algorithm which causes the robot to perform any sequence of rings when solving the Towers of Hanoi puzzle by using reasoning. The techniques that were utilized were mapping out the sequence for the robot, discover a method to code recursion to the NXT EV3 robot brick, conduct a series of trial and error tests, identify and solve any errors that arose and document the progress of the robot. Upon completion of this project, it was found that it is possible to have a robot that can complete towers of Hanoi without being given commands. A robot can be programed to use reasoning to solve any sequence.

The Legend of Zelda and the NullPointerException: Procedureally Generating Game Worlds Using Critical Path Algorithms

Andrew McPherson and Joey Shiraef
University of Tennessee - Chattanooga

The replayability of a game (which is the measure of how often the game can be replayed without becoming an unengaging experience) is absolutely important to the development and design of the project. If the replayability is high, the game can double or triple in value, since it can be played again and again. The most recent approach for improving replayability of a game has been randomizing the content of the game, such that each playthrough of the game is unique from all other playthroughs. But the algorithms for randomization can be complex, and if not implemented with care, may randomize a game that is impossible to win or isn't engaging to play. Inspired by the design of the "Legend of Zelda" for the NES, we've assembled an algorithm that will procedurally generate a random dungeon for our game. The dungeon is an orthogonal data structure of rooms, each room connected with other rooms as a part of the critical path to defeat the game. The algorithm supports a system of distributing keys and locks, methods of increasing or decreasing the length of the dungeon, and an engine for decorating each room via templates. By randomizing the dungeon, we improve replayability by 200%. The algorithm will be featured in the game our university is submitting to the Indie Game Festival Student Competition this year.

Gaming in Unity

Edenbur J. Richardson, Ray Rosier, and Xiangyan Xeng
Fort Valley State University

Unity is a software engine used to create games and simulators. Games can be made in both 2d and 3d for multiple platforms. Through my research in creating a first person shooter video game I have learned and gained experience in several aspects of game design and creation. Some of these elements of the game creation process concern the following; navigation of Unity, asset importing from multiple sources, terrain creation and editing, parenting assets, java script and script manipulation, attaching a script to an asset, raycast shooting, simple enemy artificial intelligence, manipulating asset through Unity and java script. Many of the concepts learned through Unity can be applied to other gaming engines as well. In addition to this, with game design being a multi-million dollar industry with many branches from entertainment in gaming to creating simulators for working machinery a flight simulations I do believe it is a worthwhile prospect.

World Zombienation

Toni Belasic, Chauntrell Clay, and Brian Pipkin
University of Tennessee – Martin

You are a mean, ugly, brain-eating zombie and you are contagious. You are out for world domination. To infect the scrawny humans you must attack them and beat them in a mini-game. If you win the mini-game, you will successfully change your opponent into a zombie. Humans can fight back by challenging zombies to a mini-game as well; by winning, the human is helping in the fight against the zombie apocalypse. This is a social game allowing the player to turn friends into zombies or to stop their evil plans by turning them human.

Educational Perspective: Game Development in Visual Basic .NET and Java

Paulana Hall
Fort Valley State University

Beginning computer science students are often faced with sharp learning curves. From embracing logic and algorithms, to learning a plethora of new languages and syntactical rules, computer science and programming can be quite intimidating to beginning students. From a user's perspective, computers and technology can be immensely entertaining but as technology continues to grow, improve, and become more complex, it has become increasingly difficult to draw new students into the study of technology.

Often, to build and sustain interest, students are tasked with designing a game in a specified development environment. The question then proposed is, what is the best environment to introduce students to the world of computer gaming? Some proposed requirements would be that the environment be user-friendly, conducive to error-reduction, and able to suggest or automate improvements in one's code, which most environments do offer. Further investigation may include ideas of scalability, game running speed, how easily modifications and documentation can be made, and level of support available. All of these things are subjective to the project, student, and professor alike. Nonetheless, comparative research can be done to better understand preferences for one environment over another and one language over another for different students and the game requirements.

This project compares the Visual Studio Environment of Visual Basic .NET with NetBeans Environment of Java for developing computer games. Two different games were created in both environments and compared for many of the aforementioned qualities. This perspective can be used by students and professors alike to help understand one's own preferences and how to best present learning development projects in a classroom environment.

Research Advisor: Masoud Naghedolfeizi

Developing Computer Games with HTML 5

Samantha Brown
Fort Valley State University

HTML 5 is the latest adaptation of HTML that includes new feature for advance graphics, multimedia, controls and semantic. The objective of this research was to develop a simple computer game to understand how HTML5 can be utilized to design games and its advantages and disadvantages.

The game developed in this research was Rock-Paper-Scissor-Lizard-Spock. This game includes seven semantic elements and nine buttons (five game buttons, two clear buttons, a Play button, and a main page button). It also includes a scoreboard that consists of three input boxes, two canvases to display pictures, a text area to display messages, six non-semantic elements, two HTML5 files with an internal JavaScript code, and an external CSS file for formatting and styling.

The user starts the game by clicking on a game button of their choice. This event results in showing the picture of the object selected (e.g.; Paper) and the randomly selected object by the computer (e.g.; Rock). The event also determines who wins or if there is a draw based on a set of rules designed in the game. The scoreboard counts the wins and draws. When the wins or draws reach ten points an appropriate message corresponding to winning or drawing is displayed and the scoreboard returns to zero.

While using HTML5 to develop the game, the following advantages were realized: the ability to easily add an external css file, simple coding, and the use of a text editor and a browser as opposed to expensive software packages to develop the game. Some of the disadvantages includes: it does not support MS Explorer browser, there's not enough literature about computer gaming on HTML5, other languages are needs to be learned such as css and JavaScript, and from one text editor to another, the implementation of HTML5 could change.

Research advisor: Dr. Masoud Naghedolfeizi

Crafting Tools for Video Game Development

Colton Ramos
Western Kentucky University

Graphics programming is not only an area of great commercial interest, but also an area of software development with a very high learning curve. This high learning curve acts as a barrier of entry to newcomers in computer science. To shed a more academic light on the code that makes video games and computer-generated imagery possible and lower the barrier of entry for graphics programming, I am building a graphics engine based on the popular Simple Directmedia Layer (SDL) development library in C++. Using OpenGL and GL Extensions Wrangler (GLEW) for rendering, the engine currently supports mesh and texture rendering, Lambertian lighting, camera movement and time management systems. These features are highlighted through a demo scene compiled using the engine. Built for PCs, my code base would act as a framework for other 3D applications to be based upon.

While building this framework, I am also updating a development blog to give insight to the techniques and algorithms I use. My source code, development blog, and documentation could give novice graphics programmers the tools they need to begin researching and building graphical applications of their own. In an undergraduate research group I lead at Western Kentucky University, the engine could potentially serve as a great example of how to set up a code base for developing graphical applications. After the project is finished, I will make the source and documentation available online as an open-source project for others to use and improve upon via BitBucket or GitHub.

Local WiFi iOS Platform for Classroom Use

Reza Moghtaderi Esfahani and Thomas Douglas
High Point University

As part of an interdisciplinary effort over the past few years we have worked with an Economic professor to develop a suite of iOS applications to help students gain hands-on experience with various economic concepts. Our growing frustrations were with the shortcomings of Web-based iOS application models that relied on a wired network server. This led us to develop a robust, socket-based, networking iOS application platform that does away with the need for a traditional remote server. Acting as both the client and the server, our application can function without Internet access provided there is a local area WiFi access point. We gained this independence and flexibility without sacrificing any functionality, ease of use, or reliability. We will describe our ultimate solution, share some of the design and implementation decisions we faced, and highlight a few of the many APIs, open-source projects, and other tools that we utilized.

Notes

Student Abstracts
Master's Degree Programs

An agent-based framework for constructing decision support systems for the U.S. Army's Training Support System (TSS)

Andrew Dugger and Hoda Mehrpouyan
Columbus State University

In today's fiscally constrained environment, the U.S. Army is looking critically at which Modeling and Simulation programs, currently in use are mission critical or have such a cost benefit or training improvement that they should not be cancelled. The next grand challenge to modeling and simulation is how can modeling and simulation not only facilitate capturing simulation / simulator program metrics, but provide necessary output for Commanders and staffs at Corps or above in order to facilitate decision making in a fiscally constrained environment. The practical application of solving this question is of direct benefit to the Army training strategy, readiness, program of record support, and future simulation / simulator development. By aiding in the solution of this problem, this research aids the Army by identifying through agent based modeling and decision making by focusing on the Dismounted Soldier Training System (DSTS) and Engagement Skills Trainer 2000 (EST2000) to identify which systems stay in use in the future. The goal is to gather enough usable data to utilize agent based modeling processes from the financial sector to show direct applicability to other modeling and simulation systems in use across the Army to aid in the determination of which systems is more effective in soldier training.

Voice Morphing Using Artificial Neural Networks

Tim Ojo and Yu Liang
University of Tennessee – Chattanooga

Audio morphing technology aims to transform one sound into another or combine two sounds to generate an intermediate sound. In this paper we introduce a novel approach to voice morphing using artificial neural networks. The voice data addressed in this work is in frequency domain, which is generated using short-term Fourier transformation. We train a neural network to approximate a function which takes as inputs, the frequencies of a user's voice in the act of singing and returns output frequencies that fit closely to a target voice's output frequencies. The experiment results show much promise as we are able to achieve a highly accurate transformation (99%) on a test data set.

Key Words: voice, morphing, neural network, target voice, reference voice, short-term Fourier transform.

An Agent-based Mathematical Model about Carp Aggregation

Chao Wu and Yu Liang
University of Tennessee – Chattanooga

This work presents an agent-based mathematical model to simulate the aggregation of carp, a harmful fish in North America. The referred mathematical model is derived from the following assumptions: (1) instead of the consensus among every carp involved in the aggregation, the aggregation of carp is completely a random and spontaneous physical behaviour of numerous of independent carp; (2) carp aggregation is a collective effect of inter-carp and carp-environment interaction; (3) the inter-carp interaction can be derived from the statistical analytics about large-scale observed data. As a variance of molecular dynamics method, the proposed mathematical model is based on empirical inter-carp force field, whose effect is featured with repulsion, parallel orientation, attraction, out-of-perception zone, and blind. By employing entropy theory and addressed inter-carp force field, the aggregation behaviour of carp is investigated. Preliminary simulation results about the aggregation of small number of carps within simple environment are provided. Further experiment-based validation about the mathematical model will be made in our future work.

Energy-aware Multipath Provisioning in Wireless Mesh Networks

Jesse Whitehead
University of Tennessee – Chattanooga

Multipath routing has been extensively employed in wireless mesh networks (WMNs) to provide network reliability and survivability, thereby, improving energy consumptions. To support the network survivability, we need to protect users' requests against network failure such as link or node failure. For each request, a primary path is set up for normal transmission, and an alternate path (protection path) should also be provided to protect the request in case of network failure. In this paper, we study the network survivability through the use of multipath scheme to handle dynamic network traffic, where users' requests have random arrival times. Compared to previous work, our scheme considers each link's bandwidth, reusability, and the energy consumption factors when providing multiple paths for each request, to support the network survivability under multiple failure. By applying our scheme, the numerical results show that we can improve the network survivability in handling multiple failures.

Intelligent Augmented Reality Serious Game for Mobile Platforms

Hillary Fleenor
Advisor: Rania Hodhod
Columbus State University

Technology holds great potential for educational purposes, but only if implemented in ways that provide the tools necessary for genuine learning. For technology to be an effective teaching tool, it must utilize current knowledge about how human beings learn by implementing instructional strategies that have been shown to yield results. For example, the technology must hold the attention of the user and supply motivation for continuous interaction with the learning task at an appropriate level of concentration. The technology must also present the topics within the zone of proximal development of each learner and provide scaffolding that supports continual progress. Rigorous research has been done in combining technology with education to provide motivation to the learner and help them achieve the desired learning outcomes. Serious games have been one successful example where learners are asked to play a game in which the learning tasks are weaved into the game. The game tracks the learner's performance to provide a personalized learning process by adapting the learning tasks to the learner's current skills and abilities. In this paper, I will first discuss how technologies have been utilized for education and give examples that relate these to established learning theories. This will lay the groundwork for presenting the design of an educational tool we are developing, an augmented reality serious game for Android devices, which utilizes proven learning theories and strategies for motivating players in order to teach fraction and algorithmic thinking concepts to young children.

Exploring RFID Technology for An Environmental Learning Center

Jonathan Tew, Nicolas Polhamus, and Robert King
Columbus State University

Radio frequency identification (RFID) is a technology that enables an information system to automatically identify a tagged object and collect a wide variety of information about that object using the tag. We are working on a project that aims to apply RFID technology to educate kids about nature at CSU's environmental learning center Oxbow Meadows. This center has a wide variety of exhibits ranging from different plants and trees to various types of animals including birds, snakes and alligators. Each exhibit will contain a RFID tag that will hold information about the exhibit. A mobile app will be built to allow kids to extract information regarding a particular exhibit onto their mobile phones. Currently, we are exploring 3 different RFID technologies for this project.

Arduino based reader/writer operating on the low frequency (LF) band: We have assembled a RFID reader/writer from an Arduino board and a RFID shield for Arduino, and are writing our own Arduino sketch to read and write data to the tags.

Arduino based reader/writer operating on the high frequency (HF) band: Similar to the LF Arduino reader/writer, this unit will use a RFID shield operating on the HF band (the same frequency Near Field Communication, or NFC, operates on): 13.56 MHz.

Off-the-shelf reader/writer operating on the HF band: This unit is a ready-to-use RFID reader/writer with its on software for reading and writing data to the tags. It also operates on the HF band.

*Note: All 3 use passive readers/writers and tags.

Our goal for this part of the project is to evaluate the performance of these 3 different technologies in terms of time to access required information, ease and cost of implementation, ease of use and effectiveness for the application we mentioned. In this presentation we will present these findings.

Building A Vertical Cloud

Travis Brummett
Western Kentucky Unversity

There are several different implementations of open source cloud software that organizations can utilize when deploying their own private cloud. Some possible solutions are OpenNebula , Nimbus , and Eucalyptus . These are Infrastructure-as-a- Service (IaaS) cloud implementations that ultimately gives users virtual machines to undefined job types. A typical IaaS cloud is composed of a front-end cloud controller node, a cluster controller node for controlling compute nodes, a virtual machine image repository node, and many persistent storage nodes and compute nodes. These architectures are built for ease of scalability and availability.

My research will first focus on surveying a few open source clouds, such as Eucalyptus, OpenStack, and Nimbus. I plan to accomplish this by installing each one on set of Dell computers which will have Linux installed. After I survey each, I will tear down the cloud and start again by reinstalling Linux on each machine. Thus, allowing me to start each new survey with a clean slate.

After I have completed my surveys, I intend to create an architecture for an educational cloud. This vertical cloud would be composed of a back-end and a front-end. The front-end would be a web interface that would make the use of the cloud simple for students. In theory, they would be able to simply log into the front-end. Thus, all the complexity would be hidden from them in the back-end. This would allow them easy access to software required for their courses which could be stored in a node on the back-end.

Using Unrestricted Mobile Sensors to Infer Tapped and Traced User Inputs

Trang Nguyen
Columbus State University

As of January 2014, 58% of Americans over the age of 18 own a smart phone. Of these smart phones, Android devices provide some security by requiring that third-party application developers declare to users which components and features their applications will access. However, the real-time environmental sensors on devices that are supported by the Android API are exempt from this requirement. We evaluate the possibility of exploiting the freedom to discretely use these sensors and expand on previous work by developing an application that can use the gyroscope and accelerometer to interpret what the user has written, even if trace input is used. Trace input is a feature available on Samsung's default keyboard as well as in many popular third-party keyboard applications. The inclusion of trace input in a key logger application increases the amount of personal information that can be captured since users may choose to use the time-saving trace-based input as opposed to the traditional tap-based input. In this work, we demonstrate that it is indeed possible to recover both tap and trace inputted text using only motion sensor data.

Zero Knowledge-based Trust Propagation in Airborne Networks Using Matrix Factorization

Li Dai and Joseph M. Kizza
University of Tennessee – Chattanooga

Zero Knowledge Protocol is a popular method to build trust relationship between pair entities without revealing identity from Provers to Verifiers. But it needs several rounds and a long time to finish the trust-building process which make it hard to be applied and suitable for a large entity network like P2P networks or Airborne Networks. Matrix factorization has been proved to be a successful approach to predict the rating scores between users and items in recommender systems or trust scores between users each other in social networks. In this paper we explore a new way to combine the superiority of Zero Knowledge and goodness of matrix factorization together, which need only limited rounds and time for provers to construct enough trust relationship to access the services provided by verifiers. And this trust relationship is also built based on trust scores originating from limited Zero Knowledge plus the trust scores predicted by node to node trust matrix factorization modal-based algorithm. This trust prediction algorithm takes full and effective advantage of the historical and residual distrust plus trust scores offered to and gotten from other nodes that have been built. We compare the results generated by the singular Zero Knowledge authentication and by its combination with trust prediction algorithm in simulation environment; it can obviously decrease the time for authentication process with limited accuracy lost. Our paper appears to be the first to incorporate matrix factorization to Zero Knowledge trust building and propagation.

Task Simulator with Respect to Quality

Robert Beverly
Western Kentucky University

Managers responsible for software development and maintenance must balance their responsibilities to deliver high quality software with, all-to-frequently, a minimum of resources. Experienced software managers typically schedule tasks intuitively on the basis of their experience. This research is aimed to explore the idea of making task scheduling a calculated science, rather than a craft or even an art form.

There are numerous software tools available to assist in the scheduling of software tasks, but currently there are no tools to simulate the quality produced using different scheduling policies. Our definition of software quality is a function of the risk, priority, size, due-date and resources applied to a specific task.

In this article, we discuss a simulator iCeannard (Gaelic for boss/chief) that allows a user to compare multiple scheduling policies while adjusting a task's important attributes. By examining the software quality produced over the course of many simulations, an optimum scheduling policy can be found for a company's specific resources and task distributions.

Notes

Student Abstracts
Doctoral Degree Programs

A Greedy Algorithm to Determine the Longest Suffix Prefix Overlap of two DNA Strings

Natarajan Meghanathan
Jackson State University

Given two DNA strings (nucleotide sequences) S and P (S: candidate suffix string and P: candidate prefix string), we want to find the longest suffix of S that completely overlaps with the prefix of P. We propose an efficient greedy-strategy based algorithm to determine the longest overlap string for any two strings S and P. The proposed algorithm can be useful in applications such as Genome assembly where significant suffix-prefix overlaps between pairs of DNA strings are used to construct an optimal larger sequence. Note that the length of the longest overlap cannot exceed the minimum length of the two strings. Hence, as part of initial processing of the two strings, if the length of S exceeds P, then we trim the initial portion of S that would not be needed for any comparison; likewise, if the length of P exceeds S, we trim the terminal portion of P that would not be needed for any comparison. The algorithm processes the trimmed strings S and P as follows: Compare the characters of the two strings in the inverse direction (the last character of the suffix string compared with the first character of the prefix string; the last two characters of the suffix string compared with the first two characters of the prefix string, etc) until the longest overlapping string match is found or no more comparisons are possible. The algorithm keeps track of the longest overlap string found as we compare the characters in the inverse direction. When no more comparisons are possible, the algorithm returns the overlap string found so far. The algorithm makes 1 + 2 + 3 + ... + L comparisons where L is the minimum of the length of the two input strings. The overall complexity is thus T(L^2).

A Local Spectrum Knowledge-based Routing Protocol for Cognitive Radio Ad hoc Networks

Natarajan Meghanathan
Jackson State University

In this presentation, we discuss the design of a local spectrum knowledge-based distributed routing protocol for cognitive radio ad hoc networks (CRAHNs). Referred to as the MCSR (minimal channel switch-based routing) protocol, the objective is to determine multi-hop routes whose constituent intermediate nodes will undergo a minimal number of channel switches to forward data packets on a source-destination path. This would result in lower end-to-end delay, as it takes more time at a node to switch from one channel to another channel for forwarding data packets. A cognitive radio network (CRN) comprises of primary users (PUs, licensed users whose wireless devices may not be enabled with cognitive radio) and secondary users (SUs, unlicensed users whose wireless devices are enabled with cognitive radio). A Cognitive Radio Ad hoc Network (CRAHN) is an infrastructureless network in which the SUs employ cooperation schemes to exchange locally observed information among the devices to broaden their knowledge on the PUs and the availability of channels, and decide on their actions based on this perceived local and global knowledge. Since the SU nodes operate in a limited transmission range, paths between any two nodes are more likely to be multi-hop in nature. In this context, it is crucial that the data packets get forwarded from the source node to the destination node with minimal channel switching delay. We propose an innovative idea of letting each SU node to maintain a preferred list of a minimum number of available PU data channels (that can cover the neighboring SU nodes), captured in the form of a channel switch index, and use this as the principal route selection metric in the route discovery procedure. The proposed MCSR protocol is anticipated to reduce the end-to-end delay and also be more stable compared to the standard shortest path-based routing protocol.

Contextion: A Framework for Developing Mobile Context-Aware Applications

Elizabeth Williams
University of Alabama

Context-aware mobile applications take advantage of a user's contextual information in order to adapt their features to a user's surroundings. However, these applications pose a challenge to developers because the application must continuously adapt to changes in the user's environment and surroundings. Although data from sensors on a mobile device (e.g., GPS location information, time information, and social information) can provide a rough estimation of a user's context, the data needs to be combined in an intelligent way in order to determine a user's intention. A user's intention for being in a certain situation is vital to providing relevant information, yet two users with the same contextual data can have different intentions. For example, two users traveling to the movie theater might have different aims (e.g., one may be going for entertainment purposes while the other works at the movie theater), even though contextual data sensed by their mobile devices might be the same. This paper introduces my work on the design of a framework, called Contextion, which allows developers to utilize high-level context information in mobile applications without the accidental complexity of environmental sensors. The design of the Contextion framework allows developers to obtain the intention, or motive, of the user through the use of pluggable strategies for combining and/or filtering relevant contextual data. Also, through a specification language defined in the framework, developers can define operations based on contextual data without needing to constantly poll the mobile device's sensors for new contextual data.

Distributed Learning For Polytope Artmap In The Framework Of Structural Risk Minimization

Xinpeng Liao
University of Alabama

Among learning theories, controlling the generalization of a learning machine and constructing learning algorithms can vary considerably from one to the other. Different from conventional NNs and SVMs, there at least exists one kind of neural network that does not take advantage of superposed linear indicator functions but employs hypothesized geometry as indicator functions, which shares some characteristics of SVM by constructing and separating hyperplanes in the original input space rather than in the high dimensional kernel space. The most recent Polytope ARTMAP (PTAM) suggests irregular polytopes as the basis to compose more flexible indicator function to approximate the decision boundary. However, the polytopes cannot cover input space efficiently for the limited category expansion. After these analysis, this paper then proposed Distributed Polytope ARTMAP (DPTAM), enhancing PTAM to combine speed, performance, generalization, and code compression in a variety of applications. DPTAM not only allows different polytopes expand towards the input pattern simultaneously, but also permits simplex overlap which is from the same desired prediction. To generalize well, distributed learning without dynamic weight vectors provides higher region cover efficiency and attempts to bound the rate of generalization of DPTAM to control its VC-dimension. Experiments show that 1) DPTAM retains PTAM's accuracy while ameliorating memory compression with less sensitivity to the variation of minimum simplex angle; 2) and cross-validated SVMs, although appealing in some cases, cannot outperform DPTAM on irregular geometry data set and Adalone.

Notes

Professional Abstracts

Post-mortem email analysis of the website chair for ICSE 2014

Brian Toone
Samford University

The International Conference on Software Engineering is a major annual conference with many research presentations, workshops, tutorials, and co-located conferences. This year's conference was held in Hyderabad, India May 31 - June 7, 2014. I have completed my duties as the website chair, and the conference was a great success. Last year at the ACM Mid-Southeast Conference, I presented my email analysis of the emails received to that point in preparation for the upcoming ICSE conference. This year I will present my post-mortem email analysis as a way of exposing the duties of website chair. Several open-source and commercial email classification tools are compared. Additionally, a custom program written specifically for this task is compared to a manually sorted and categorized analysis of the email communication. Results are presented to give future website chairs an insight to the role of website chair.

Virtual Worlds and Conservational Channel Evolution and Pollutant Transport Systems (Concepts)

Chenchutta Jackson
Austin Peay State University

Many models exist that predict channel morphology. Channel morphology is defined as the change in geometric parameters of a river. Channel morphology is affected by many factors. Some of these factors are caused either by man or by nature. To combat the adverse effects that man and nature may cause to the water system, scientists and engineers develop stream rehabilitation plans. Stream rehabilitation as defined by Shields et al., states that restoration is the return from a degraded ecosystem back to a close approximation of its remaining natural potential (Shield, Copeland, Klingeman, Doyle, and Simon 575-584). Engineers construct plans that will restore streams back to their natural state by using techniques such as using field investigation, analytical models, or numerical models. Each of these techniques is applied to projects based on specified criteria, objectives, and the expertise of the individuals devising the plan. The utilization of analytical and numerical models can be difficult, which among others can be caused by the intuitiveness of the modeling process. Many numerical models exist in the field of hydraulic engineering, fluvial geomorphology, landscape architecture, and stream ecology that evaluate and formulate stream rehabilitation plans. One goal that will be explored in the field of Hydroscience is creating models that are not only accurate but also span the different disciplines. The goal of this dissertation is to transform a discrete numerical model (CONCEPTS) into a realistic 3D environment using open source game engines, while at the same time, conveying the same, equivalent, accurate information that was presented in the 1D.

Programming Across the Science Curriculum

David Frazier and Hannah Leverentz
Tusculum College

Every science student must develop a set of skills that they can use in both their academic work, and in their careers. Traditionally, this set of skills has included a good dose of math, a foundation in chemistry, physics and biology, and oral and written communication skills. We suggest that a new skill set be added: programming. As in other academic areas, science has entered the age of Big Data. Scientists have access to much more data than was previously available. Finding efficient ways to process this data into useful information is of great value. The best tool for this is to teach programming to all science majors.

We are in the early stages of developing such a course at Tusculum College. Our presentation will be on what we have found out and where we are heading. We will also address institutional issues such as adding such a course to already full science degree programs and who should teach this class. One of the presenters is a Computer Scientist with a background in programming. The other is a computational chemist that has used programming in her research.

Exploring SAP ERPsim in the Business Curriculum: Transforming Management Information Systems at East Tennessee State University

Stephen Hendrix
East Tennessee State University

One of the core concepts in Management Information Systems is focused around data in enterprise applications. Students in the MIS course spend a significant amount of time learning about different theories and techniques as it relates to data and the transformation of data into information to assist in business decisions. However, the challenge in an academic environment is engaging and educating the student beyond the case studies and the textbook. The desire is to provide students with opportunities to engage these principles in a hand-on, simulated environment. Utilizing ERPsim, teams of three to four students will have the opportunity to operate a make-to-stock cereal manufacturing company inside of one of the largest enterprise resource planning applications, SAP ECC. Through this real-time, simulated lab environment, students will be engaged in procurement, production, sales, marketing, and other components needed to successfully run a manufacturing business. In addition, students are able to utilize and analyze the transactional data in order to make business decisions for their business.

This presentation will discuss the journey of transforming the Management Information Systems course offered at East Tennessee State University into a course that utilizes ERPsim as a critical educational tool in the classroom. Through this transformation, the course now offers students an opportunity to put into practice their educational experiences in an interactive, competitive, and fun environment.

MOCS, An NSF-funded study to improve the percentage of computer science and computer engineering majors who obtain four-year degrees from colleges and universities.

Jack Thompson
University of Tennessee – Chattanooga

The National Science Foundation has awarded funds to the Computer Science and Engineering Department at the University of Tennessee at Chattanooga to be used to design and implement processes and procedures that will improve the graduation rate of computer science and computer engineering students. We call this program Making Opportunities for Computer Science and Computer Engineering Students (MOCS). I would like to present the program we have started at UTC and discuss some of the preliminary results.

Efforts to Increase Retention in an Undergraduate Computer Science Program

Joshua T. Guerin and Bob Bradley
University of Tennessee – Martin

The problems of recruitment and retention in undergraduate computer science programs are well-known to computer science educators. In 2013 and 2014 our department added two new courses to address issues commonly encountered by first-year students at our university. The primary motivating factors behind the additions were to encourage growth and improve retention in the first year.

The first course was designed specifically for non-majors (or students considering a major in computer science) who may not be pre- pared for a full semester of programming (CS 0). The second course is meant to serve all declared computer science majors as a general introduction to college life that is specifically tailored to computer science majors (freshman studies at our university).

In this presentation we will discuss factors that motivated the additions, considerations made during course design and implementation, and some preliminary results.

A High School Project Clarifying the Scientific Computing Paradigm

A. Louise Perkins
University of Southern Mississippi

The current K-12 curriculum contains significant modeling exposure. However, these examples are mostly used to augment traditional content, and are not emphasized in and of themselves. Further, the modern computing practice of simulating physical systems can not be fully appreciated without it's historical context to stress the nature of the approximations, and highlight the difficulty of the solutions. We provide a high school project, developed from a historical perspective, and discuss a variety of possible solutions that are in use today. The project is instructive, and yet simple enough to develop without extensive background in any particular science field.

Hidden Curricula in Computer Science

William Hooper and Joyce Crowell
Belmont University

The most important things students learn in our courses don't appear in the syllabi and are hard to articulate in Student Learning Outcomes. Resilience, respect for people and machinery, a balance of humility and warranted self-confidence: fostering these traits in our students are some of the outcomes we can accomplish as teachers. These subtle outcomes are called the hidden curriculum or implicit education precisely because they aren't explicitly stated in course materials or captured in assessment data.

One of us presented this topic as part of an interdisciplinary team at the 2012 Lilly Conference on College Teaching. Scholarship on hidden curricula has appeared in the journals Higher Education and Assessment and Evaluation in Higher Education. Meanwhile, we have continued to refine our approach to the hidden curriculum in our own classes.

This talk will begin an overview of hidden curricula, and of the curricula we have identified in classes ranging from CS0 through upper-division courses. We will use the bulk of the time, however, as an informal workshop. Attendees will be invited to form small groups and prompted with questions designed to bring their own hidden curricula to light. We will conclude by discussing the implications of hidden curricula for our profession.

References

Bergenhenegouwen, G. (1987). Hidden curriculum in the university. Higher Education, 16, 535-543.

Giordano, Peter, Sue Trout, Joyce Crowell, David Ribar, Steven Simpler & Mike Awalt. Valuing the Hidden Curriculum: Stimulating Teaching Vitality in Mid- and Late-Career Faculty. 34th Annual Lilly International Conference on College Teaching, Miami University, Oxford, Ohio, November 15-18, 2012.

Sambell, K., & McDowell, L. (1998). The construction of the hidden curriculum: Messages and meanings in the assessment of student learning. Assessment & Evaluation in Higher Education, 23, 391-403.

A Brief Introduction to Data Science

Ken R. Adcock, Jr.
UPS

In both the technical and business press, terms such as Data Mining, Analytics, and, Machine Learning can be seen everywhere. Although not without controversy, these terms are frequently placed under the umbrella term: Data Science. These terms are essentially the result of a collective rebranding effort on concepts that have been around for decades. After all, one can find the very same concepts discussed in great detail in Statistics, Quantitative Methods, and Machine Learning text books for years. However, there is a key difference between present day and the past. What is different is the amount of focus on this domain from the business world, which perceives this as the next and best opportunity for competitive advantage.

What is not given proper credit in the general business press is how this is enabled through improved accessibility to technology. We now have mature high-quality open-source programming languages such as R and Python along with relatively inexpensive hardware. Furthermore, we have rich community ecosystems via the abundance of technical manuals, blogs, and YouTube videos on how to use these programming languages. Of course, one cannot overlook the impact of so-called Big Data and associated frameworks such as Hadoop and Spark. Finally, we now have the ability to access all of this technology through scalable cloud-based platforms with just a web browser and a credit card.

This presentation will provide a brief survey of the Data Science landscape with specific focus on the software options and associated ecosystems that are driving this focus. The primary goal of this presentation is to show the fascinating intersection of computer science, data, and statistical analysis.

DPSL - A Database Privilege Specification Language

David Frazier
Tusculum College

Many Web pages today are database driven. It just makes sense to tie the organizational power of a database with the Web's ability to format data in an attractive manner and make it available worldwide. The simplest of these Web pages use a database designed just for that Web page. If the information contained in that database is compromised, the damage will be limited. Other Web pages access data that is much more valuable. Think of the information contained in a large ecommerce Web site database. This information is very attractive to hackers.

The normal way to create a Database Driven Web Site is to use a Web Programming language like PHP, ASP or Java to connect to the database as the root user. This eases the job of the programmer, as root has access to all tables and all fields of the database. The problem is that if a hacker compromises the Web page through something like a SQL Injection, they too have total access to all of the data.

In a perfect world, every Web page that connects to a database would only have enough access to get the job done, and no more. In the real world, this is a difficult task. In this presentation, I will introduce the idea of a specification language to allow automated generation of Database users with custom privileges. The rights needed will be specified in a format that comes from the formal specifications community.

The basic idea is that the programmer will create a file for each Web page in DPSL. It will specify what privilege is need for each table and each field. Eventually, this file can be run through a program that will output the SQL statements necessary to set up a user with that privilege.

A Dynamic Software Development Cycle

Louise Perkins
University of Southern Mississippi

The Agile manifesto described a programming style far removed from the traditional academic software lifecycle at the time. Agile programming was, in many ways, a reaction to Big Design Up Front (BDUF). We represent this historical shift in software development as a movement away from static design and towards dynamic software development. We present the current state of software development in a light that makes these changes appear inevitable, and even desirable. Shorter shelf life, rapid obsolence, and faster development time all argue for a dynamic software lifecycle.

Cocos2D-JS - One SDK to Rule Them All

Bob Bradley and Kurt Wesner
University of Tennessee – Martin

Imagine being able to write a game / app that can:

run anywhere on all major platforms (desktop and mobile), with only one code base
include hot updates for both graphics and logic
run at native speed and take advantage of the GPU

HTML5 can deliver the first two, but not the last. Native apps can deliver the last, but not the first two.

Enter Cocos2D-JS.

Cocos2D-JS is an open source game / app development platform that gives you all of the above advantages. In addition to producing web apps, you can build native apps for all the major platforms including Mac OS X, Windows, iOS and Android. With this system, you write all of your app logic code in JavaScript. This code can run (and be debugged) right inside any web browser. When you build a native version of your app, the system uses the same JavaScript code to drive the native compiled platform version of the Cocos2D-X library for the system you build it for. This allows for one single code base, that takes advantage of the raw native graphics speed of the platform.

As you can imagine, there are always gotchas and tradeoffs. Being an open source project comes with its advantages and disadvantages as well. Problems include: frequent updates to the SDK that are not backwards compatible and totally break previous code, updates that have many known bugs, terrible documentation with a terrible website that is full of missing and broken links, several platform inconsistencies, etc.

This talk will give a brief introduction to the Cocos-2D-JS SDK platform and discuss both its advantages and some of the challenges we have faced while converting some of our apps to this system.

The Reality of Using Visual Technologies in CS1

Kellie Price and Suzanne Smith
East Tennessee State University

At the Department of Computing at East Tennessee State University, a multi-semester study was undertaken which introduced visual technologies in the CS1 course. Visual technologies were explored as a way to present difficult programming concepts in a manner that is easier to visualize and simpler to use. The purpose of this study was to determine if visual technologies could make learning programming easier by minimizing the syntax of the programming language being used and providing visual feedback to the students to aid in conceptualization of the programming constructs. The study used the following visual technologies to supplement the established CS1 curriculum: RAPTOR for supporting algorithm development and Alice for supporting object-oriented programming concepts.

It has been two years since visual technologies have been implemented in the CS1 curriculum at the Department of Computing at East Tennessee State University. During this time, Raptor and Alice have been used to supplement the classroom instruction in CS1. However, the level and manner of usage have changed from what was initially anticipated. This presentation will describe what has worked and not worked in using Raptor and Alice in CS1. It will also describe other visual technologies that are now being included to fill in the gaps in our goal of increasing student interest and retention in CS1.

Improving the odds of success in Computer Science 1 (version 2.0): Adding Computational Thinking

Wayne Summers
Columbus State University

Between 30% and 60% of every university computer science department's intake fail the first programming course.1 In this age of RPG (Retention, Progression, and Graduation), this is not acceptable. This paper discusses several successful and unsuccessful strategies for improving RPG in the first programming class, Computer Science 1 (CS1).

Thinking that the problem was the language, the author's university moved from teaching C++ in CS1 in 2004 to Java and saw a drop in the pass rate [A, B, C] from 59% to 51%. Adding a closed lab two years later brought the pass rate back to 59%.

The author taught CS1 in 2007-2008 using Media Computation and Java. He was able to increase the pass rate of his sections above his colleagues. In addition, his students performed as well as the students from a traditional Java class. However, expanding Media Computation and Java to all sections in Fall 2008 resulted in a return of the pass rate to 59%, AND met with resistance from several faculty.

As reported two years ago at ACM MidSE, the author tried a unique approach that consisted of introducing computer programming using Python for 5-6 weeks followed by the remainder of the semester being taught in Java. This format resulted in a pass rate of 80% in Spring 2012 with less significant improvements in later offerings. This past year (2013-2014), all faculty taught using this Python/Java format resulting in a pass rate of 67% across all sections taught by several faculty. However, the feedback from students was mixed with a number of students expressing concern about the difficulty learning two languages in one semester.

This semester we decided to only teach Python to introduce programming concepts and transition to Java and object-oriented programming in CS2. Over the summer, several of the CS1 faculty developed material for teaching Computational Thinking to K-12 teachers. Building on this material, the CS1 faculty agreed to introduce computational thinking concepts and exercises in the first two weeks of the classes. This combination has appears to be successful with over 70% of the students passing the class and students excitedly commenting that they can use computational thinking in their other classes.

Results from this fourteen year study will be shared at the presentation as well as a discussion of the computational thinking concepts and exercises used in the classroom.

1 "Separating Programming Sheep from Non-Programming Goats," http://www.codinghorror.com/blog/2006/07/separating-programming-sheep-from-non-programming-goats.html, created - July 14, 2006, last viewed October 10, 2012

2 Wing, Jeanette M. (2006). "Computational thinking". Communications of the ACM 49 (3): 33. doi:10.1145/1118178.1118215.

Comparison of First Java Course Taught Online and Face to Face

Kathy Winters
University of Tennessee – Chattanooga

Teaching and taking online courses is becoming a standard in today's education paradigm. A growing number of students expect to be able to take their courses online and we as educators are expected to deliver the material online. According to Changing Course: Ten Years of Tracking Online Education in the United States, the proportion of chief academic leaders that say online learning is critical to their long-term strategy is now at 69.1 percent and 32 percent of all student have taken at least one online course. Twenty three percent of academic leaders believe the learning outcomes for online education are inferior to those of face-to-face instruction. This semester I am teaching two sections of our first programming course, Java 1, one online and one face to face. This presentation will compare the two sections. At the time of the presentation, the courses will be not be completed. However, I should have sufficient data to compare the performance of the two sets of students. I will discuss the differences and similarities of the two courses as well as the performances of the two sets of students. I will also discuss difficulties encountered and plans for the future.

Developing Applications Using Microprocessors to Supplement Undergraduate Computer Programming Laboratories

Masoud Naghedolfeizi, Sanjeev Arora, Nabil Yousif, and Xiangyan Zeng
Fort Valley State University

Students in programming classes could enhance their learning of the subject matter by implementing their programming knowledge to design simple and fun applications for microprocessors. For instance, they could program a microprocessor to turn a light on and off at certain times or to play musical notes.

Microprocessors such as various versions of Lunchpad systems (Arduino Boards) from Texas Instrument (TI) are very low cost and could be easily adopted as part of laboratory exercises for programming classes. For example, MSP430 Lunchpad hardware with its Energia software system (Arduino programming environment) could be easily used to teach students various concepts of programming such as looping, decision structures, and arrays in a fun way. The programming environment is based on C/C++ languages and the environment syntaxes are simple and easy to understand. The environment supports all basic C/C++ programming data types, math functions, control structures, as well as a number of specific functions used to interface with the hardware. Educational resources such as user manual and sample programs are available within the software system.

This paper describes the applications of microprocessors for programming classes. It also provides information about various educational resources available for using microprocessors in classrooms.

Applications of Virtualization in Information Technology (IT) Systems

Gary Miller and Masoud Naghedolfeizi
Fort Valley State University

In the field of computing, virtualization refers to creating an artificial or synthetic environment using certain computing elements or systems, e.g. computers, operating systems, storage devices, servers, computer networks, etc. The most important goal of virtualization is to maximize the use of the computing power available in physical or real computing systems.

This paper describes the application of virtualization techniques utilized by the Office of Information Technology (IT) of Fort Valley State University (FVSU). The use of both software and hardware virtualization in the IT area has resulted in reducing costs while increasing efficiency and scalability of our computing systems. The FVSU IT department has utilized VMware, an industrial software system for creating virtual environments of computing systems, to establish virtual machines, operating systems, and storages devices. For example, one physical server (machine) hosts 10 virtual machines that run various operating applications and multiple operating systems. Each of these virtual machines has their own virtual CPU, memory, and storage units. Currently, the FVSU email system is run on one of these virtual machines, while the backup email system works in parallel on another virtual machine. With the snapshot technology built into our virtual environment we are able to backup live virtual machines without having a drop in service to the campus services. Restoration of a virtual machine is also a painless task. This is a key feature in routinely testing our disaster recovery process through the year.

This paper also discusses the advantages and disadvantages of virtualization in industrial settings, including the concept of near- or 100% uptime.

Characteristics and Scheduling Issues of Magnetic Hard Disks and Solid-State Disks

Srinivasarao Krishnaprasad
Jacksonville State University

Until recent years, most of the personal computers used the magnetic storage medium via the hard disk drive (HDD) for their secondary storage. HDD provides a nonvolatile storage capability and its ready availability & maturity in the industry has driven its popularity so far. Unlike HDD, a Solid-State Disk (SSD) uses flash memory circuits to provide nonvolatile storage with no moving parts. SSD has quickly become the industry choice in various personal computing devices such as netbooks, ultrabooks and many of current laptops. Some of the characteristics that differentiate SSDs from HDDs include speed, capacity, price, energy consumption, availability, durability, noise and form factor. Also, by providing a suitable combination of both SSD & HDD storage one may achieve each other's advantages: primarily the performance of an SSD coupled with large space & low price of HDD. In this setup, the SSD acts like a buffer for frequently used system & application files so that the computer will boot faster and launch applications quicker.

Disk scheduling algorithms are optimized for the traditional HDDs. Since seek time contributes to most of the disk access time, the scheduling algorithms try to minimize the total seek distance. The various strategies that are discussed in the literature on operating systems include First Come First Serve (FCFS), Shortest Seek Time First (SSTF) and Elevator (SCAN). But these algorithms do not apply to SSDs as the latter do not have any rotational latency or seek operations. Several researchers have proposed and investigated scheduling techniques specific to SSD technology. They have exploited the fact that in an SSD, read service time is almost constant and write service time varies quite a bit. Strategies suggested include appropriate grouping of write requests to eliminate any ordering-related restrictions and to maximize write performance while read requests scheduled independently.

Boolean Satisfyability Encoded Using Three Valued Two State Analytic Logic

Louise Perkins
University of Southern Mississippi

We construct a binary-tree based modified Non-Deterministic Finite State Automata (NDFSA) or BiND for the three valued, two state Analytic Logic. We show that parallel semantics is sufficiently powerful to model Boolean Satisfyability. Our BiND constrains the NDFSA to have fan out of exactly two at every interior node (amongst other modifications). The resulting model takes the form of a BINARY-TREE. The work relies on trinary logic; the third state allows us to simulate parallel advancement through the model. The BiND may be viewed as a functional computational model for Boolean Satisfyability - you provide an input function (the boolean expression), and the BiND leaf states are re-configured to either satisfiable or not-satisfyable states.

Medical Image Denoising by Anisotropic Diffusion and Independent Component Analysis

Xiangyan Zeng, Masoud Naghedolfeizi, Sanjeev Arora, and Nabil A. Yousif
Fort Valley State University

Denoising is an active research field in medical image processing and has attracted much attention in decades. Low-pass filtering (for example, Gaussian filtering) is a common technique for image denoising, which unfortunately smoothies edges while reducing noise and thus blurs the image. An improved technique is anisotropic diffusion that is related to adaptive smoothing. Anisotropic diffusion methods can smooth noise without blurring edges. However the iterative diffusion process tends to bring about an enlarged edge effect in the original image. Wavelet shrinkage methods have been widely used and gained much success in medical image denoising. The basic motivation behind this method is that the wavelet coefficients of many signals are often very sparse so that one can filter out noise easier in the wavelet domain. As an alternative to the wavelet transform, independent component analysis (ICA) also produces sparse components and is data-adaptable. ICA is a computational method for transforming data into components that are statistically as independent as possible. We here propose a medical image denoising method that incorporates anisotropic diffusion and ICA. An image is decomposed into independent component coefficients, and anisotropic diffusion is applied to filtering the independent component coefficients. The proposed method achieved much better noise suppression with minimum edge blur effect compared with other denoising methods, such as original anisotropic diffusion filter and wavelet shrinkage. The effectiveness of the proposed method is demonstrated by simulation experiments on medical image denoising.

A Computer Architecture/Organization Team Project Assignment: Reverse Engineering the MARIE Processor

Joseph V. Elarde
Austin Peay State University

This paper and associated presentation describe a team project used in our Computer Architecture/Organization course providing students with hands-on development of a processor called MARIE. The project is based upon the model processor (MARIE) described in the Null and Lobur textbook and MMLogic simulator work by Stanley, et al. Our initial interest was to design MARIE from the ground up, but due to time constraints and course outcome requirements, we were limited to a half semester project at best. Leveraging the prior work with limited documentation proved sufficiently challenging, but achievable given the constraints. The students were able to reverse engineer MARIE, recommend improvements, and implement some enhancements to the prior work while improving their understanding of MARIE in a compressed timeframe. We will discuss the project/assignment design, experiences, and summarized results from a student survey.

Incorporating the ARM-Based Raspberry Pi into a Computer Architecture Course

David L. Tarnoff
East Tennessee State University

Computer architecture has been a suggested component in the study of computer science since ACM began making curriculum recommendations, but as processors incorporate more complex strategies to improve performance and security, computer architecture instruction has become largely theoretical. In the 1980's, students and hobbyists alike could get hands-on experience with low-cost single-board computers. The clock speeds and interfacing requirements were slow enough to allow students to interface with the system bus, add I/O peripherals, and fully examine the processor's architectural features. In the intervening years, the drive for performance improvements and the increased gap between hardware and software due to operating system requirements have hindered an applied study of computer architecture.

With the advent in 2011 of the ARM-based Raspberry Pi, the computer architecture student could once again get hands-on experience using a single-board computer. Resources within the ARM processor and on the Raspberry PI board allow students to practice principles of I/O, measure pipeline and cache performance, configure and utilize timers, implement interrupts, examine virtual memory implementation and operation, and even implement small clusters. The ARM architecture fully supports the requirements of the ACM/IEEE computer architecture curriculum and lends itself easily to a discussion of topics such as instruction set architecture, shadow registers, and predication. The ARM architecture's Thumb instruction set even allows students to perform a comparison between 32-bit and 16-bit instruction sets within the same processor.

This presentation discusses how the Raspberry Pi was incorporated into a computer architecture course along with a description of the laboratory setup, examples of student assignments, and a discussion of the assessment results.

Hands-on testing of students' Forensics competency using a case study of Chinese House Churches

G. Jan Wilms
Union University

One criticism of industry certification tests is that because they are mostly Multiple-Choice based, a good test taker who has never had any hands-on experience with the technology can still get a passing score by cramming exam-specific self-study guides. Only a few tests like the Encase EnCe forensics exam have a practical follow-up component where competency is tested in a hands-on fashion.

Union University offers an ethical hacking/forensics class where we use a similar model of a takehome where students receive a virtual (vmware) hard drive where they have to locate and document evidentiary materials of intentionally hidden criminal activities. Using child pornography as a test-bed, while certainly real-world and apropos, would be too controversial and a liability. Because Union is a Christian institution, we decided a fitting case study and an integration of faith and learning would be hidden biblical references. In some countries like China only state sponsored religion is allowed, and independent house churches are illegal and actively prosecuted. Hence practitioners intentionally use fuzzy terms like daddy to refer to God the Father. A forensic examination thus is not just a simple search for obvious phrases like Christ, Bible, Thou, etc.

Students are tasked to find 10 evidentiary materials, each hidden using different mechanisms. These range from the obvious (hidden attribute, deleted but not yet overwritten, recycle bin), to thwarting mechanisms to prevent string searches (renamed extension, zipping, unicode), to more hardcore obfuscation (ADStream, slack space, removed partition, printer spool file). We even used steganography with a password to be cracked (the target picture was identified through a supplied notable hash file).

While most students did well on the theory test, some struggled with the hand-on exam, but knowing the number of evidence materials to be found and the specific search parameters gave them the confidence to succeed.

On Incorporating Security Concepts into a Networking Class

Vijay Bhuse
East Tennessee State University

We describe our experience of integrating broad range of fundamental information security concepts and challenges, including (but not limited to) hacking into the computer science curriculum. We take a holistic approach in exposing students to various information security issues in relevant classes. For example, buffer overflow can be explained better in an introductory programming class. Denial of service attacks can be explained better in a web related classes. User awareness and physical security can be explained better in a system administration class. In this paper, we particularly focus on integrating network security related issues, attacks and defenses in our Fundamentals of Networking class at the Department of Computing at the East Tennessee State University. We specifically focus on the following issues:

(1)Introduction to network based Access Control Lists to block access to hosts or networks based on IP (and network) addresses or protocols such as HTTP (web traffic) or FTP.
(2) Introduction to wireless security issues and solutions.
(3) Sniffing network traffic using Wireshark (with a network card in a promiscuous mode).
(4) IP and MAC address spoofing.
(5) Two firewalls and demilitarized zone (DMZ) setup along with Network Address Translation (NAT) to isolate private network from adversaries from the internet.
(6) Switch port security to disable guests from plugging in their portable computers to wired network and spreading malware.
(7) Encryption and Authentication issues related to Virtual Private Networks (VPN).
(8) Securing Switch and Router configurations to prevent malicious users from altering it.

We found that with the addition of hands on labs, students understood the above network security issues better in the networking class itself.
Keywords- Computer science curriculum; information security; hacking; network security; DMZ; NAT; VPN; malware.

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–Doctoral	**Session I– Undergraduate 4**
	Chair: Joe Dumas	Chair: Michael Galloway
9:15 AM	Meghanathan	Nelsen
9:35 AM	Meghanathan	Hicks
9:55 AM	Williams	Edison
10:15 AM	Liao	Groom, Pirkelbauer
	Session II– Masters	**Session II– Undergraduate 4**
	Chair: Jackie Thompson	Chair: June West
10:40 AM	Fleenor	Carpenter, et al
11:00 AM	Tew, et al	al Bishi, et al
11:20 AM	Brummett	Jallouk
11:40 AM	Nguyen	Thomas, et al
12:00 PM	**Lunch–Patio Restaurant**	
	Session III–Masters and Poster Session	**Session III– Undergraduate 2**
	Chair: Jackie Thompson	Chair: Hoda Mehrpouyan
1:00 PM	Dai, Kizza	Omojaro
1:20 PM	Beverly	Pankov
1:40 PM	Poster Session	Townsend
2:00 PM	Poster Session	Flynn, Sadler
2:20 PM	**Break–Poolside**	
	Session IV– Undergraduate 4	**Session IV– Undergraduate 2 and Undergraduate 4**
	Chair: June West	Chair: Hoda Mehrpouyan
2:35 PM	Snider	Alsammarraie
2:55 PM	Bowen	Churvis
3:15 PM	Woodard	Jones
3:35 PM	Harber, et al	Zayatz, et al
4:30 PM	**Business Meeting–Highlander I**	
7:00 PM	**Awards Banquet–Azalea**	

	Dogwood II	Highlander I	Highlander II
7:30 AM	**Morning Coffee–Poolside**		
8:00 AM	**Welcome and Keynote Address**		
9:00 AM	**Coffee Break–Poolside**		
	Session I - Masters	**Session I– Professional**	**Session I– Professional**
	Chair: Britni Alexander	Chair: Ken Adcock	Chair: Denise Williams
9:15 AM	Dugger, Mehrpouyan	Toone	Thompson
9:35 AM	Ojo, Liang	Jackson	Guerin, Bradley
9:55 AM	Wu, Liang	Frazier, Leverentz	Perkins
10:15 AM	Whitehead	Hendrix	Hooper, Crowell
	Session II– Undergraduate 4	**Session II– Professional**	**Session II– Professional**
	Chair: Britni Alexander	Chair: Ken Adcock	Chair: Denise Williams
10:40 AM	Bay	Adcock	Price, Smith
11:00 AM	Carter	Frazier	Summers
11:20 AM	McKinnon	Perkins	Winters
11:40 AM	Henderson, Maynard	Bradley, Wesner	Naghedolfeizi, et al
12:00 PM	**Lunch–Patio Restaurant**		
	Session III– Undergraduate 4	**Session III– Professional**	**Session III– Professional**
	Chair: Kathy Winters	Chair: Greg Kawell	Chair: Bob Bradley
1:00 PM	Mobbs, Chouchane	Miller, Naghedolfeizi	Elarde
1:20 PM	Olotu, et al	Krishnaprasad	Tarnoff
1:40 PM	Causey	Perkins	Wilms
2:00 PM	Hooper	Zeng, et al	Bhuse
2:20 PM	**Break–Poolside**		
	Session IV– Undergraduate 4	**Session IV– Undergraduate 4**	**Session IV– No Session**
	Chair: Kathy Winters	Chair: Greg Kawell	
2:35 PM	Hooper, et al	Hall	
2:55 PM	McPherson, Shiraef	Brown	
3:15 PM	Richardson, et al	Ramos	
3:35 PM	Belasic, et al	Esfahani, Douglas	
4:30 PM	**Business Meeting–Highlander I**		
7:00 PM	**Awards Banquet–Azalea**		

Glenstone Floor Plan