CS offers iPhone Course Fall ‘10

UCA’s Computer Science Department is now offering a course on developing applications (commonly referred to as “Apps”) for Apple’s popular iPod, iPhone, and iPad devices. The initial offering for this course is the Fall 2010 semester and it is conducted in a hands-on laboratory setting in the Mac Lab maintained by the Math department in room MCST 214. Students develop multimedia apps integrating audio, core graphics, and OpenGL technologies. Application Programming Interfaces using Twitter, You-Tube, and Google Maps are also utilized in building a variety of real-time, multi-threaded apps allowing users access to these emerging and ever popular technologies. Students initially test their apps using Apple’s iPhone Simulator, followed by the subsequent app installation on their actual iPod, iPhone or even iPad devices. UCA is a member of Apple’s iPhone Developers University, thus allowing all students free installation privileges for all apps they develop for all devices that they posses. Taught by Dr. Mark Smith.

CS1 Introduces Gaming
Games, Graphics, and More

Computer Science curriculums have been undergoing major revisions in recent years. One important nationwide trend is the increased utilization of graphics in Computer Science courses. UCA’s Computer Science department has also followed this trend by completely revising its Fall 2010 Computer Science I course with the implementation of graphics, animations, and games in all C++ programming projects. Students continue to learn all the fundamental topics of C++ as in previous semesters, but now have the ability to create far more interesting (and visual) projects using an Open-GL based library. Students implement versions of familiar games such as Blackjack and Space Invaders, while also creating numerous simulations (e.g., a slot machine) as well. Animations involving slide shows and videos (such Computer Science II course in Spring as the animated Christmas Tree and Santa Claus project shown above) are also popular projects with students. Future plans include the integration of graphics with the 2011. Taught by Dr. Yu Sun and Dr. Mark Smith.

New Data Mining Class Generates Student Interest

Dr. Bernard Chen proposed and taught a new course entitled “Data Mining” in the Computer Science Department. Three bioinformatics research papers generated by the course have been accepted and published in the 2010 international conference on Bioinformatics and Computational Biology (BIOCOMP 2010), Las Vegas, NV, July 12-15, 2010. Two of the three research papers were presented by undergraduate students, Michael Miller, Timothy Montgomery, Terrance Griffin, Christopher Rhodes, Christopher Kline, and Luke Irvin. Michael Miller also delivered an oral presentation (acceptance rate: 27%) titled “Clustering Using Positional Association Rules Algorithm on Protein Sequence Motifs” to an audience of bioinformatics experts. Christopher Rhodes presented his research results “Protein Sequence Motif Information Generated by Fuzzy - Hybrid Hierarchical K-Means Clustering Algorithm” in a poster session.
Two University of Central Arkansas students have made it to the finals of a Microsoft sponsored technology Competition with a software design that has implications for the treatment of skin cancer. The UCA Ursus Team’s software tracks the speed of a skin lesion’s progression to better diagnose and treat skin cancer. Team members are sophomore Brendan Lee of Alma and Muhyeddin Ercan, an international student from Turkey. Team mentor is Dr. Sinan Kockara.

The first round of the Imagine Cup U.S. finals was scheduled in April at the Microsoft campus in Redmond, Washington. The theme was: Imagine a world where technology helps solve the toughest problems. More than 200,000 teams from more than 100 countries participate in the annual international competition. The UCA team is competing with teams from Brigham Young University, Arizona State University, and the University of California – Los Angeles. “Our students learn to find creative solutions to real-world problems. Thus, they become one of the technology leaders of tomorrow,” Kockara explained.

The Image Cup 2011 Worldwide Finals will be held in July at New York City. The grand prize is $8,000.

The Computer Science Department hosted the 3rd Annual PyArkansas Conference on Saturday, October 16th. The annual one-day conference was organized by the Arkansas Python Users Group for people interested in the Python Programming Language. This year’s conference attracted about 60 participants including practitioners in industry and students and faculty members from multiple universities. Although most participants were from the Natural State, several of them came from Louisiana, Missouri, New York, and Texas.

UCA Computer Science faculty member, Dr. Bernard Chen, gave a tutorial on Simple Game Design. Mr. Wayne Werner, a Computer Science undergraduate, delivered an Introduction to GUI Programming.

Computer Science Team, consisting of Jason Barnes, Christopher Mitchell, and Marcus Trusello, won Third Place in the 2010 ACM Mid-Central USA Programming Contest at the University of Arkansas on November 8, 2010. Ben Nordin served as student coach.

2010 Regional Programming Contest of the Consortium for Computing Sciences, Midsouth Region, was held March 2010. Two teams competed: “Quantum Fuzzy Team”, Derek Anderson, Jason Barnes, & Marcus Truscello won Second Place by solving 5 problems. “The Null Terminators Team”, Jordan Loney, Christopher Mitchell, & Wayne Werner placed thirteenth. Thomas Winters, a CS graduate student, coached teams and helped prepare them for competition. Dr. Vamsi Paruchuri is Student Advisor.
**Paruchuri Travels to NSF Summit**

*Dr. Vamsi Paruchuri*, Assistant Professor of Computer Science, received a travel support from the National Science Foundation (NSF) to participate in the Broader Impacts for Research and Discovery Summit (http://www.nsfbirds.org/), in Washington D.C., June 21-23, 2010. This two day summit in Washington D.C. was intended to develop guidance materials for the NSF Directorate for Computer & Information Science & Engineering (CISE) research community on how to integrate activities that address the NSF broader impacts review criteria into their research. Through participating in the event, Dr. Paruchuri led the development of the first REU (Research Experience for Undergraduates) grant proposal from this College with focus on broader impact activities.

**Development of Methods to Enable Shared Control of Mobile Robot Navigation on Soft Soil**

*Dr. Yu Sun*, Associate Professor of Computer Science, received a grant in the amount of $3,000 from the NASA EPSCoR Research Infrastructure program as a Co-PI. The funded project is titled “Development of Methods to Enable Shared Control of Mobile Robot Navigation on Soft Soil”. Bryan R. Schardt, an undergraduate student major in computer science is involved in the project. Robotic planetary exploration is essential to NASA in unmanned precursor missions and extended human-robotic missions. In almost all robotic exploration missions, a mobile robot (Fig.1 (a)) is expected to move on terrain with soft soil (e.g., The sandy soil of Mars). This poses a great challenge on the robot: a robot may become immobile and out of its mission if its heels sink too much into the soil (Fig.1 (b)). Our approach to dealing with this challenge is to introduce human intervention to share the control of robot in case of difficult terrain situation. To enable this shared control between robotic autonomy and human supervision, we need to transmit high quality video of wheel-soil interaction to the control station for human control. By observing wheel-soil interaction and terrain scenario captured by video cameras, a human controller takes over control of the robot and drives the robot to a safe region. We use five cameras in a lunar robot. One camera is used to observe terrain ahead of the robot for navigation, and the other four monitor wheel-soil interaction. Facing to the challenge of huge video data vs. limited bandwidth, an efficient video compression scheme is required and our research objective is to acquire high compression ratio while fully utilizing the available network bandwidth to optimize the encoding video quality. To achieve this objective, we have developed a comprehensive video compression scheme which dynamically determines encoding parameters for 5 videos so as to jointly regulate the overall compression rate to meet the available network bandwidth while obtaining optimal quality. Our experimental results have demonstrated that our proposed scheme has achieved high compression performance for human shared robot control. We are preparing the research papers and will submit them to leading conferences and journals soon.

**Breast Cancer Research**

*Dr. Sinan Kockara*, Assistant Professor of Computer Science, has established an active collaboration with Professor Umit Topaloglu at UAMS. This collaboration has resulted in a $20,000 Scholarship from UAMS for UCA graduate student Vincent Yip to work as a Graduate Assistant for the Arkansas Breast Cancer Research Program in 2009-2010. This funded research was specifically focused on automatically discovering concepts from cancer medical reports. As a result, they developed a framework that supports physicians’ decisions on pathology reports to extract cancer staging with machine learning algorithms. In May 2010, *Vincent Yip* defended his Master’s thesis “Concept Discovery for Pathology Reports using an N-gram Model” co-directed by Dr. Kockara and Dr. Topaloglu. Vincent received the first Outstanding Graduate Student Award in the department. His work with Dr. Kockara is published in the 2010 AMIA Summit on Translational Bioinformatics, which is ranked as one of the top conferences in the field with impact factor 0.96 over 1.00. Vincent Yip is now pursuing his Ph.D. in the Computer and Information Science Dept. at the University of Oregon with a full scholarship.
In October, Dr. Sinan Kockara from the Computer Science department published a journal article as co-corresponding author in BMC Bioinformatics. In this study, they introduce a Mixed Reality surgical simulation tool for surgeons’ training on artificial cervical disc replacement surgery on the neck. Until quite recently spinal disorder problems in the U.S. have been operated by fusing cervical vertebrae instead of replacement of the cervical disc with an artificial disc. Cervical disc replacement is a recently approved procedure in the U.S. It is one of the most challenging surgical procedures in the medical field due to the deficiencies in available diagnostic tools and insufficient number of surgical practices. For physicians and surgical instrument developers, it is critical to understand how to successfully deploy the new artificial disc replacement systems. Without a proper understanding and practice of the deployment procedure, it is possible to injure the vertebral body. Mixed reality (MR) and virtual reality (VR) surgical simulators are becoming an indispensable part of physicians’ training, since they offer a risk free training environment. In this study, MR simulation framework and intricacies involved in the development of an MR simulator for the rasping procedure in artificial cervical disc replacement (ACDR) surgery are investigated.
Computer Science Student Awards

The Computer Science Department presented two awards at the Poster Symposium May 23. Jonathan Wammack was awarded a $500 scholarship by the Arkansas Academy of Computing. Vincent Yip won the 2010 Outstanding Graduate Award from the Computer Science Department. Axiom and Data-Tronics also provided students Scholarship to be awarded Spring’11.

Computer Science Research Article Published

In June, Dr. Sinan Kockara, his graduate student Vincent Yip, and undergraduate student Brendan Lee from the Computer Science department published an article in Bioinformatics. Bioinformatics is a top-ranked journal published by Oxford University press. Their research paper was entitled “A soft kinetic data structure for lesion border detection.” In this research, they developed a new algorithm that automatically and accurately finds borders in skin cancer lesion images. This is illustrated in the exemplary images below.


FACULTY EXPERTISE

Bioinformatics – Dr. Bernard Chen
Business Informatics – Dr. Victor Sheng
Health Informatics – Dr. Sinan Kockara
Mobile Devices – Dr. Mark Smith
Multimedia – Dr. Yu Sun
Network and Security – Dr. Vamsi Paruchuri
Scientific Computing – Dr. Chenyi Hu
Software Engineering – Dr. Paul Young

Dr. Victor Sheng is an assistant professor in Computer Science at University of Central Arkansas. He was an associate research scientist in the information systems at Stern Business School, New York University after he graduated from the University of Western Ontario. As a computer scientist, he has broad interests, particularly in data mining, machine learning, and the related applications. Over the past years, he has made significant contributions to the research area known as “utility-based data mining”: outsourcing data acquisition, cost-sensitive learning, and selective data acquisition. All of these topics have arisen from attempts to use data mining and machine learning techniques for real-world applications, where costs and benefits must be taken into account. He has published his work in top data mining and machine learning conferences (KDD, ICML, AAAI, ECML, ICDM, etc.) and journals (i.e., TKDE). He also has applied research results to real-world applications, such as software development (collaborated with Sun Microsystems) and medical diagnosis, and online sentiment analysis (collaborated with IBM Research Lab). He has won awards for his outstanding research, such as KDD best paper award runner-up, NSERC Postdoctoral Fellowship, and NSERC graduate scholarship.
The Computer Science Club has had a busy semester! They put on their semiannual Ultimate Challenge with about 20 in attendance. Events included Tech Jeopardy (manned by Cody Hudson, with buttons provided by Phillip Smith), the Big Game with challenges in a variety of categories such as trivia, programming, and web technology (a joint effort by all of the CS Club officers with assistance from Jason Elliot and Tyler Baskerville), followed up by a LAN party. Participants played the Open Source FPS, Nexuiz. Next semester will be even better, with plans to visit a museum, informal talks by faculty members, and hands-on experiences.

---

**IT Academy, A Pilot Program for Middle and High School Students**

For the first time, the Arkansas Center for Mathematics and Science Education (ACMSE) hosted a summer computer programming workshop for middle and high school students. ACMSE, in collaboration with Computer Science Department, offered a four day summer IT Academy technology session (July 19-22, 2010) for local 8-12th grade students. The IT Academy is designed to heighten students' interest in the Information Technology program and to encourage them to continue their education beyond high school. Thirteen students from Conway, Greenbrier, Mayflower and Oppelo attended this program. Students learned computer programming basics and designed games using the Python program, Alice Education Software for 3D Environment, Gamemaker Software for 2D Environment and FPS Maker. Students indicated that the IT Academy provided valuable information and increased their interest in the computer science program. Several participants wanted a higher level of programming for next year. We received excellent comments from the participants. Sample student’s comments included: “I had fun and the instructors were great and really wanted to teach us”, “This class is great, and I think they should have more classes”, “IT Academy is a very fun project/class. I just wish that there was another one that’s the same, except longer (I have a lot of time at home, despite the camps)” and “I liked this class I thought it was helpful and made me see what I want to do.”

Dr. Uma Garimella, director of ACMSE organized this program and Drs. Bernard Chen and Sinan Kockara, along with Mr. Michael Nooner, Computer Science faculty, presented the training to the students.
As the first step of establishing collaboration with area K-12 schools, the Department of Computer Science organized a road trip to Mayflower High School on April 27, 2010. Four CS student projects were presented to the 11th and 12th grade students. These projects included Video steganography by Christopher Rhodes and Matt Tanner; Game Programming by Wayne Werner; Password Cracking by Luke Irvin; and Robotics by Matthew Johnson. Following the student presentations, Dr. Vamsi Paruchuri and the Principal Jason Lawrence made remarks to all participants. Our College Dean, Dr. Steve Runge and CS Department Chair Dr. Chenyi Hu also participated in the event and promoted both the programs in the Department of Computer Science and the new STEM Residential College.

The CS Department plans to organize similar presentations in multiple schools with the recruitment help of Mrs. Karen Thessing. She is currently mailing out information packets containing, brochures, DVD’s and various posters with possibilities and opportunities in Computer Science. She will plan school visits in the Spring semester around the state.

I-SWEEP is a science fair open to middle and high school students. It is organized by the Cosmos Foundation, a non-profit educational organization in Houston with a mission to establish college preparatory K-12 schools focusing on math, science, engineering, and computer technologies in an effort to provide a world class education to the public. Dr. Sinan Kockara also participated in the I-SWEEP in Houston. Dr. Kockara was the state representative for the event and was also a judge. More than 1,000 young scientists, from more than 43 states and 69 countries, participated in 2010 I-SWEEP. In addition, Dr. Kockara set up a booth to introduce the Computer Science Department at UCA and answer students’ questions.
Conferences

Michael Nooner and Dr. Chenyi Hu together with Professor Carl Burch (Hendrix College) and Matt Brown (Arkansas Tech) served in the panel "CS 0: Why, What and How?" at the 2010 Midsouth Conference of the Consortium for Computing Sciences in Colleges, March 26, 2010 at Harding University.

Dr. Chenyi Hu participated the 4th Extremely Large Databases Conference from October 6-7, 2010 at Stanford University.

Dr. Yu Sun, ”Incremental Rate Control for H.264 Scalable Video Coding,” Presented at IEEE Global Telecommunications Conference (Globecom 2010), Miami, FL, Dec. 2010.

Vincent Yip, Dr. Bernard Chen, Dr. Sinan Kockara, ”Extraction of Protein Sequence Motifs Information by Bi-Clustering Algorithm” paper presented at BIOCOMP2010 in Las Vegas.

Dr. Bernard Chen, Michael Miller, Timothy Montgomery, Terrance Griffin, ”Clustering Using Positional Association Rules Algorithm on Protein Sequence Motifs”, paper presented at BIOCOMP2010 in Las Vegas.

Dr. Bernard Chen went to Research Conference Pilot Program held by Arkansas Research Alliance (ARA) on Oct 30th ~ Nov 2nd held at the Winthrop Rockefeller Institute in Petit Jean, Ark.


Bernard Chen, Christopher Rhodes, Christopher Kline, Luke Irvin, ” Protein Sequence Motif Information Generated by Fuzzy - Hybrid Hierarchical K-Means Clustering Algorithm”, International Conference on Bioinformatics & Computational Biology (BIOCOMP2010), Las Vegas, USA, pp.198-201 (Short Research Paper (SRP) Accepted)


Research Agency Supports CS Faculty

S. Kockara - UAMS, ASTA, NSF, UCA - URC, UCA – SP, UCA Foundation

Y. Sun – NASA, UCA- URC

P. Young – NSF – ESPCoR

C. Hu – NSF/CISE/CCF-0727798

V. Paruchuri – UCA - URC