CSS Focus: Prof. Kelvin Sung

The abstract nature of computer science (CS) makes it a challenge for students to learn and educators to teach. Prof. Kelvin Sung sees this as a challenge that can be overcome through game-themed introductory courses.

Since 2006, with the help of Microsoft Research, Sung and his students have created games that help facilitate learning fundamental CS concepts. “The work we have done with Microsoft Research has been quite successful,” explains Sung, “people have been quite receptive in terms of the concept.”

However, creating the games using C# and Microsoft’s XNA game platform has affected how well they are adopted by other institutions. Many institutions teach their introductory programming courses in languages other than C#, such as Java and C++.

Sung is in the process of securing funding from the National Science Foundation (NSF) to convert and expand these games to incorporate other popular programming languages.

To assess these games’ effectiveness in teaching students CS concepts, Sung has teamed up with UW Bothell’s Dr. Cinnamon Hillyard (Interdisciplinary Arts and Sciences) and Dr. Robin Angotti (Education).

This teaming has led Sung into another, new venture in game-themed teaching. “Professor Angotti is someone who has this tremendous passion for teaching mathematics,” says Sung, “she likes to see how technology can be used to teach mathematics.” Through the help of Partners in Learning and Microsoft Research, Sung and Angotti have begun experimenting with Microsoft’s newest gadget, the Kinect.

“Kinect is a very sophisticated sensing device,” explains Sung, “so if we use [it] as a way to teach math, it’s something that can be very interesting.”

Currently, Angotti is taking existing Kinect games, such as Kinect Sports and Dance Central 2, and noting certain moments within these games where math concepts can be introduced or further explored by instructors, such as when a player creates an angle with their arms during a dance move. She then deploys her Kinect units to nearby schools and observes how students are learning math concepts.

Improving upon this idea, this summer Sung and his students began developing software (through the use of the Kinect SDK) to help create a more personal and interactive math learning experience. A student will be able to create lines, graphs,
Dear Alumni and Friends of CSS,

As I do twice a year, I find myself sitting down to write this letter, thinking about everything that has happened in the CSS Program since the last issue of this newsletter, and feeling somewhat out of breath as a result. More and more people are involved in UW Bothell CSS. Undergraduate enrollment is running 8% up for 2011-12 compared with last year; graduate enrollment is up 43%. Last year, we produced 67% more bachelor’s degrees than the year before.

These are just numbers. What’s more important are CSS people and what they do, some of which is described in this issue. We welcome a new faculty member: Prof. Joe McCarthy. The impact of our faculty members’ work becomes broader: one example is Prof. Kelvin Sung’s introduction of Kinect-based software into K-12 mathematics education. The quality and influence of our faculty and student research shows in the number and variety of publications and presentations produced and grants earned. Our students produce ever more amazing projects and internships across an ever increasing range of industries and organizations, including original games, social networking sites, and parallel computing algorithms.

This issue of Bits & Bytes presents just a sampling of all this activity.

Cordially,

Dr. Michael Stiber
Professor and Director

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BOEING SCHOLARSHIP AWARDS

The Boeing Company has generously awarded the CSS program three $1,500 scholarships for its students for the 2011-2012 school year.

For more information how on to apply, contact the UW Bothell Office of Financial Aid at 425.352.5240 or finaid@uwb.edu.

NEW FACULTY

Joe McCarthy is an irrepressible instigator, connector and evangelist, investigating and inventing technologies that bridge the gaps between people, places and things in the digital and physical worlds. His work spans the areas of artificial intelligence, ubiquitous computing, human-computer interaction and computer-supported cooperative work.

Most recently, he has been teaching senior-level computer science courses at the University of Washington, Tacoma’s Institute of Technology. Previously, he established and directed Strands Labs Seattle, where he led a research and development team for Oregon-based Strands Labs, Inc. Prior to joining Strands, Joe was a senior research scientist at Nokia, Intel and Accenture.

He holds a Ph.D. in Computer Science from the University of Massachusetts, and his career includes earlier roles as entrepreneur, professor and consultant. Joe has authored or co-authored over 40 technical publications, given over 50 presentations, and has served as Conference Co-Chair of CSCW 2002, General Chair of UbiComp 2003, Program Co-Chair of UbiComp 2008, and Chair of the UbiComp Steering Committee from 2003-2009.
Tell us about your project

DNAliens is a mobile phone game made for Android OS. Players can generate and mix DNA to create unique alien pets that move around using the Box2D physics engine. The aliens are also rag-doll bodies, which means that they have joints for their arms, legs, and head, which are all powered by Box2D. Players can also post their aliens’ DNA codes to Facebook using a QR code, which their friends can scan and then inject it into their own DNAliein egg.

The purpose of creating this game was to help validate the new physics and social networking capabilities that I added to the ACS1Lib, which is an Android game engine that I have been working on for the last year. The ACS1Lib is also based on Professor Sung’s XNA gaming library - XNACS1Lib.

How did you come up with this concept for the game?

One day I was browsing the Android market when I found a pet game called Furdiburb. It featured simple physics and one type of alien pet that players could care for. I’d also previously played a Flash-based DNA game on the internet called Seed, where players mix the DNA of flowers to create new types of flowers. These two particular games inspired me to create DNAliens, which is essentially combination of the two. Since I’d also wanted to integrate physics and social networking capabilities into the ACS1Lib for some time, I found that this would be the perfect opportunity to combine everything into one single game. With all of the new functionality being used in DNAliens, I was able to test everything thoroughly and make sure it was all working as intended.

What challenges did you face and how did you overcome them?

The biggest challenge I faced during this project was integrating social networking features using the Facebook API. Unfortunately, there were a lot of issues with it. One of the biggest was getting the correct hash-key so that my app could communicate with Facebook. Apparently you can’t get the correct key on a Windows machine; it had to be generated using Linux or OS X.

The next challenge was learning how to create NDK (Native Development Kit) libraries for Android. Typically, Android programming is done in Java, but developers also have the ability to create libraries in C++. It was important to use the C++ version of Box2D because Java’s garbage collection can cause gameplay to slow down.

Other than that, the only other challenges were tinkering around with physics forces to create alien movements that didn’t look strange.

If you’re planning on pursuing a career in game development, how did this project help?

Prior to this project, I did get the opportunity to work at a game studio that was creating an Xbox Live Arcade game. However, I found my true interest to be in mobile development, which I have decided to pursue full-time. Because there are not many experienced Android developers out there right now, learning how to create Android apps has definitely opened more exciting employment opportunities for me.
ELIRAN ERETZ-KEDOSHA
ATG Stores
Developing a related items web part and algorithm
Eliran worked with ATG Stores, which sells lighting, furniture, plumbing, etc. The goal of his project was to show customers products similar to those they just looked at. Some things he considered during his project were selected filters, titles, styles, price range, etc.

ALINA GALAN
BTN Design LLC
Web Development
The goal of Alina’s project was to develop a clean, elegant, accessible and user-friendly website for BTN Design, LLC - an eco-friendly landscaping company based in Seattle. The project included the design, implementation and testing of a web-based application to meet both the business and technical requirements of the sponsor. Since part of her project required her to store and retrieve information from databases, she opted to learn ASP.NET MVC3 with Razor, using C# as her target language, and SQL. The novelty of the project was to attempt to provide cues for the reader about the website’s information structure and contents, context, and navigation in terms of aesthetics and good design traits.

RYAN HOAGLAN
Big Fish Games
Sticky Wicket
Ryan worked on the third iteration of Big Fish Games’ Drawn series. His internship gave him the opportunity to be involved with almost every aspect of game production, from design all the way to release.

BENJAMIN LENTZ
Taksoni, LLC
MyCyclist: Mobile Application
Benjamin's project created a mobile application specifically for cycling, named MyCyclist. The application is a tool people can use to find and create local cycling events. Users can create a basic profile with basic information about themselves and their 'skill level'. This skill level is used as an optional metric for local meeting searches. One unique feature of this project was that it utilizes a mobile device’s GPS system to precisely search nearby for games with the user’s current location. MyCyclist's primary goal is to promote local and social biking, enabling communities to enjoy cycling together.

SEAN KEATING
Rhino Computer Solutions, LLC
Building Ignite
Sean created the beginning of a new website that helped people find, share, and play sports. This site provides users the ability to make a personal profile, find other people and groups to play sports with, places to play, and much more. The site is expected to be released by October 2011 at www.igniite.com

CHRISTOPHER PHELPS
Seamonster Studios
Automating the UltraCart for E-Commerce Customization
Christopher’s project aimed at creating an automated workflow and tool set that allowed for the creation of customized e-commerce webpages by tailoring the functionality provided by the UltraCart software service.

SID MAXWELL
Oltis Software LLC
Finance Logix Mobile App
Sid’s project was to port and re-develop an iPhone application, called Retire Logix, to Android environment. The Retire Logix application allows the users to input their income sources (Social Security, pension, annuities, and other bank accounts), the cost of their needs (yearly expenses like house payments, food, and other expenses), wants (Vacations / new cars / etc.), and other variables such as inflation, retirement age and time horizon, and generates a visual display in the form of a money capsule and a graph of whether or not their assets will cover their needs/wants in the projected years.

WARNER SMIDT
CSS Faculty Research
Massively parallel simulation using CUDA supported GPUs
Warner’s research involved simulating the interactions of neuron activity, cell culture development, and network behavior. There are currently three versions of the simulation: single threaded, multi-threaded, and the GPU version that he worked on. In the past, the single threaded version ran a simulation of 100 neurons in about 12 hours. The goal with the GPU version was to achieve 10,000 neurons in a similar length of time.
Mentally bridging the gap between classroom-taught concepts and real-world application can be a difficult task for students and instructors. This issue is further complicated when course concepts require interaction with ‘clients.’ Traditionally, instructors approach these challenges by forming student teams and introducing projects that push them to work with one another in a business-client relationship.

Yet, this approach still lacks the true realism that can only be achieved by interacting with real clients. So this past spring, Prof. Asuncion had her CSS 503 (Software Engineering Methods) students, as part of their course-long project, work with Prof. Angotti’s BEDUC 566 (Education and Technology) Masters of Education students.

One of the most prominent aspects of software engineering is the idea of working with clients to identify their needs and to develop a solution that meets those needs. Prof. Angotti’s BEDUC 566 students were tasked with gathering pedagogical information and data from digital and electronic sources that could be used in a classroom setting. Prof. Angotti describes the course as “designed for teachers of any subject at the K-16 level to explore ways to use emerging technologies to enhance classroom instruction.”

The CSS students not only acquired technical skills, but they also gained hands-on experience...

Prof. Hazeline Asuncion (CSS)

A challenge often faced by educators, such as Prof. Angotti’s students, is finding, extracting, and converting raw data into presentable information. Prof. Asuncion’s students met this client need by working in tandem with Prof. Angotti’s to create software solutions to help facilitate this otherwise time-consuming process. “As the students interact with each other, we had intended that the CSS students would also be able to answer any technical questions that the Education students may have, thus making the interaction mutually beneficial to students from both courses,” Prof. Asuncion comments.

During the early stages of the project, an issue that arose for both sides that made the requirements gathering phase challenging was language. Prof. Angotti’s students had a hard time understanding some commonly used computer science jargon, while Prof. Asuncion’s students struggled to understand frequently used Education lingo. In time, however, both sides overcame this barrier and developed creative solutions. Some of these solutions included Excel macros that automatically grabbed data from online resources and presented them within easy-to-read spreadsheets, data extracting software for PDFs, a data consolidation software for Excel, a Google Earth overlay for visualizing geographic data, and Google Docs templates that users could simply copy data into and that then would apply algorithms created by CSS 503 students to calculate appropriate outputs.

This inventive cross-department collaboration not only helped augment the client-business relationship in software engineering but also highlighted some real-world challenges that software engineers face on a daily basis. “The CSS students not only acquired technical skills, but they also gained hands-on experience with eliciting customer requirements,” Prof. Asuncion remarks. Prof. Angotti adds, “At the end of the course, the education students felt more confident in their abilities both in terms of technology and interdisciplinary collaboration. The project empowered them to feel like valued members of a team and that their ideas were an integral part of the design process.” Due to its success, Prof. Asuncion plans to continue using this kind of approach in future classes she teaches.

CS1 (or introductory CS course) assignments introduce students to simple computer science concepts such as loops, conditional statements, and sorting.

The adventure game will consist of mini-quests in which the player will have to demonstrate their understanding of a CS concept in order to complete the quest and advance further into the game.

Some preliminary ideas of mini-quest scenarios include battling wizards using conditional statements and sorting and even a shop inventory management system using file input/output.

“This game should be done in the next week or so,” says Sung, “we are getting feedback from our CSS 161/162 faculty. We are also exploring the possibilities of using this game as a programming assignment or as an extra curriculum ‘for fun’ exercise for our students.”

Teaching and learning computer science concepts does not have to be as challenging of a task. By skillfully incorporating modern technology and trends, Prof. Sung and his students are helping transform an otherwise difficult process into a simpler and more enjoyable experience.

To learn more about Prof. Sung’s various projects, visit his website at http://faculty.washington.edu/ksung.
**PUBLICATIONS**

**A Design of Flexible Data Channels for Sensor-Cloud Integration**

**A Multi-Process Library for Multi-Agent and Spatial Simulation**

**A Parallelization of Orchard Temperature Predicting Programs**

**Agent-Based Workbench for On-the-Fly Sensor-Data Analysis**

**Can Graduating Students Design: Revisited**

**In Situ Data Provenance Capture in Spreadsheets**

**Presenting Software License Conflicts through Argumentation**

**Students’ Perceptions of the Differences between Formal and Informal Learning.**

**The Multidimensional Role of Social Media in Healthcare**
McCarthy, Joe. ACM Interactions (July/ August 2011).

**GRANTS & AWARDS**

**Advanced Placement Computer Science Principles Pilot Course**
Microsoft Research, 2011-2012. Kelvin Sung (PI), Lawrence Snyder, University of Washington, Seattle (co-PI), Cinnamon Hillyard (IAS), Erin Hills (Quantitative Skills Center).

**Connecting e-Science Information Sources Through Automated Data Provenance**
Royalty Research Fund, June 2011, Hazeline Asuncion

**Curriculum for Windows Phone 7 Gaming Platform**
Microsoft University Relations and Microsoft Studios, 2011-2012, Professor Sung

**Kinections in Education**
Microsoft Research and Microsoft Partners in Learning, 2011-2012. Robin Angotti (PI), Kelvin Sung (co-PI).

**PRESENTATIONS**

**Biomimicry: Innovation of the Future (Brought to you by the Past)**

**Can Graduating Students Design: Revisited**

**Mobile Computing, Smartphones, and Existing Computer Science Classes**

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**‘ALIENS’ CONT.**

**What past CSS classes and/or materials did you find most helpful during this project?**

The classes that helped me most during this project were Professor Erdly’s CSS 490 Game Design course, Professor Sung’s Game Programming and 2D Graphics courses, and Professor Zander’s CSS 343 course. All of these courses gave me invaluable knowledge that was necessary to make my project a success.

**How can we get our hands on this game?**

Right now DNAliens is probably not going to be on the Android Market for several months. I am currently working another physics-based Android game called “I Like Turtles!” which is taking up a large majority of my time. However, when I get more time to polish the game and add more interesting functionality, I will definitely add it to the market - so keep an eye out!

**Can other students use your library?**

Yes! Students interested in using the ACS1Lib to create their own games can access it at http://androidcs1lib.assembla.me. They are also allowed to sell the games that they create.
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