UW BOTHELL

SUMMER 2009

UNIVERSITY OF WASHINGTON BOTHELL

COMPUTING & SOFTWARE SYSTEMS

Bits & Bytes

CONTENTS

UNIVERSITY of WASHINGTON BOTHELL

CSS Focus: A Little Sabbatical Q&A

Dr. Fukuda and Dr. Olson have been on sabbatical for about a year and are nearing completion. Dr. Fukuda visited numerous cities and universities around the globe while Dr. Olson has been working with NASA's Jet Propulsion Laboratory. To get a better understanding of their research, we asked them a few questions regarding their sabbatical.

Dr. Clark Olson

Dr. Munehiro Fukuda

Can you describe what you did on your sabbatical?

Dr. Olson: I have been working with the Jet Propulsion Laboratory (JPL) on processing aerial image sequences. The goal has been to automatically match locations between image sequences captured on different days in order to correct errors in the estimated camera position for each image. The procedure that I've been using has been to select distinctive landmarks in the images and characterize them according to the nearby image properties. Matching between images is performed by locating pairs of landmarks with similar properties. The landmarks can then be tracked into subsequent frames of each image sequence. This portion of the work has been completed. The portion that I am still working on is to use the matched landmarks between the sequences to update the estimated camera positions.

Dr. Fukuda: I visited four different research and commercial organizations: (1) PDM&FC at Lisbon, Portugal last summer, (2) Keio University at Shonan-Fujisawa Campus, Japan last autumn, (3) Universität Basel, Switzerland this past winter, and (4) University of California, Irvine in the spring.

At PDM&FC, I parallelized Almunsur, their online strategic game on top of AgentTeamwork, the grid-computing middleware I have developed with support from NSF (2005 - 2007). At Keio, I developed a parallel YouTube video-clip downloader and an analyzer using my collaborator's video analyzing tool (named Autonoesis) and my AgentTeamwork system. At Basel, I proposed and prototyped a computing-resource field of multiple network segments using the collaborator's autonomous network architecture (ANA) system and am planning to create an environment to move user processes over that field in search of the best computing nodes. At UC Irvine, I am implementing a library for parallel multi-agent spatial simulation that utilizes both multi-cores and a cluster of computers. This library, named MASS, will be ultimately available on top of AgentTeamwork.

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Letter from the Director

Dear Alumni and Friends of CSS,

They say time flies when you're having fun, so we must have had a lot of fun in the Computing & Software Systems (CSS) Program this year. It's been incredibly busy, with enormous changes taking place both within CSS and in conjunction with other UW Bothell programs. Outside CSS, Arnie Berger led the creation of an Electrical Engineering degree (with able support from Megan Jewell) and Chuck Jackels helped found the new Science and Technology (S&T) Program. Kelvin Sung and Bill Erdly have been working on a new S&T degree in Interactive Media Technology. Within CSS, our Master of Science degree is scheduled to admit its first students for Fall 2009 (seats are limited, so contact us to learn more) and our undergraduate enrollment is up strongly this year.

These and other initiatives are described in more detail elsewhere in this issue. You'll find interviews of Munehiro Fukuda and Clark Olson about their sabbaticals; faculty promotions, publications, and grants earned; a story about two of our students' experiences at the UW Undergraduate Research Symposium; description of two of the new UW Bothell degrees CSS faculty have helped start; and highlights of this year's cooperative education internships.

Summer is our time to regroup, re-evaluate, re-build, and prepare for the next year. It's also a good time to get in touch with us to find out how you can make a difference in the future of CSS. We believe that what makes us special is the close relationships we maintain with our students and our alumni, and the connections among our curriculum, the needs of industry, and area professionals' career aspirations. We like to think that our success is your success, and vice versa.

Sincerely,

Dr. Michael Stiber
Director & Professor

Faculty Promotions

We'd like to highlight and congratulate our two CSS faculty members on their recent promotions to Full Professor.

Kelvin Sung

Kelvin Sung received his Ph.D. in Computer Science from the University of Illinois at Urbana-Champaign in 1992. His background is in computer graphics, hardware and machine architecture. He came to UW Bothell from Alias|Wavefront (now part of Autodesk) in Toronto, where he played a key role in designing and implementing the first version of Maya Renderer. He also co-designed a patented motion blur algorithm. Images generated based on that algorithm can be found in movies including Independence Day and Wing Commander. Before joining Alias|Wavefront, Kelvin was an Assistant Professor with the School of Computing, National University of Singapore. Kelvin's research interests are in studying the role of technology in supporting human communication. Most recently, funded by National Science Foundation and Microsoft Research, Kelvin's works are related to teaching and learning of computer graphics and foundational concepts in programming based on computer games.

Michael Stiber

Dr. Stiber received a BS in Computer Science and a BS in Electrical Engineering from Washington University, St. Louis, in 1983, and his MS and PhD in Computer Science from the University of California, Los Angeles in 1992. He has held positions with Texas Instruments (Dallas, Texas), Philips (Eindhoven, Netherlands), and the IBM Los Angeles Scientific Center. He has been an Assistant Professor in the Department of Computer Science at the Hong Kong University of Science & Technology, a Research Assistant Professor in the Department of Molecular and Cell Biology at the University of California, Berkeley, a Visiting Associate Professor in the Electrical & Computer Engineering Department at the University of Florida, and a frequent visitor to the Department of Biophysical Engineering at Osaka University (Japan). Dr. Stiber came to UW Bothell just one year after the CSS Program started. His research interests span the intersection of computing, physics, and biology, especially regarding the computational characteristics of biological nervous systems. Most recently, he has been examining how functional networks of neurons develop in the brain, building simulations to take advantage of and help build out UW Bothell distributed and high-performance computing facilities. Besides being CSS Interim Director, he is also Executive Director of the UW Bothell Biotechnology & Biomedical Technology Institute.

FACULTY PUBLICATIONS

Carol Zander

Saying Isn't Necessarily Believing: Influencing Self-Theories in Computing

In Proceedings of the Fourth International Workshop on Computing Education Research (Sydney, Australia, September, 2008). ICER '08.

Simon, B., Hanks, B., Murphy, L., Fitzgerald, S., McCauley, R., Thomas, L., and Zander, C. 2008. ACM, New York, NY, 173-184.

CS1 Students Speak: Advice for Students by Students

In Proceedings of the 40th SIGCSE Technical Symposium on Computer Science Education (Chattanooga, TN, USA, March, 2009). SIGCSE '09

Hanks, B., Murphy, L., Simon, B., McCaulay, R., and Zander, C. 2009.

Learning Styles: Novices Decide

In Proceedings of the 14th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education (Paris, France, July, 2009). ITiCSE '09.

Zander, C., Thomas, L., Simon, B., Murphy, L., McCauley, R., Hanks, B. Fitzgerald, S. 2009.

Computer Science Student Transformations: Changes and Causes

In Proceedings of the 14th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education (Paris, France, July, 2009). ITiCSE '09.

Moström, J. E., Boustedt J., Eckerdal, A., McCartney, R., Sanders, K., Thomas, L. and Zander C., 2009.

Kelvin Sung

Essentials of Interactive Computer Graphics: Concepts and Implementation

K. Sung, P. Shirley, and S. Baer. A.K. Peters, December 2008.

A Look Inside: Faculty Grants

Clark Olson

$74,251 Grant

Jet Propulsion Laboratory

Registration & Recognition of Aerial Images

The problems of mapping, object recognition, and tracking using aerial images are important in many applications (examples include geographical information systems, environmental management, consumer mapping Web sites, and aerial surveillance). JPL has been developing a system for aerial mapping and recognition using multiple high-resolution cameras.

Their current work focuses on calibrating the cameras and generating seamless mosaics of the images. Considerable research is necessary to use the images to construct three-dimensional maps and to perform recognition and tracking in the images. My research in this area will have two thrusts. One is in developing three-dimensional maps from these images and the other is in recognizing and tracking objects in the images. This recognition problem is closely related to the problem of retrieval from image databases, since the sensors will generate a large library of images. It will be useful to be able to answer queries with respect to the presence of various objects, structures, or terrain in these images.

Michael Stiber

$59,947 National Science Foundation Grant

Collaborative Research

Phase 3 Design, Implementation and Dissemination of Multidisciplinary Online Java-Digital Signal Processing (J-DSP) Materials.

The project, a collaboration involving Arizona State University (ASU) as the lead institution, Johns Hopkins University (JHU), University of Washington Bothell (UW Bothell), Prairie View A&M University (PVAMU), and Rose-Hulman Institute of Technology (RHIT), is expanding the use of an award winning software package (J-DSP) and instructional approach into a broad set of new areas including digital signal processing, earth systems and geology, renewable energy systems, arts and media, ion-channel systems, and genomics.

Online modules are being designed, deployed, and assessed by a geographically-diverse multidisciplinary team. This educational technology provides free and universally accessible web-based Java software with an intuitive interface that enables instructors to create web-based lectures with synchronized online simulations and animations and to monitor student progress and preferences. It allows students, including distance learners, to conduct online laboratories and collaborate across disciplines, to perform simulations anytime anywhere, and to collaborate online with their colleagues at other universities.

The evaluation effort is using self, peer, and instructor assessments to measure the quality of student learning by adapting a set of online assessment instruments developed on a previous grant dealing with a set of signal processing courses. The project team is working to disseminate the instructional materials by postings on the project's Web site and on a discipline-based site (CNX.ORG), by links with the NSDL, by faculty workshops, by conference presentation and journal publications, and by high school and industrial outreach. Broader impacts include an involvement of two MSIs, an outreach effort focused on minorities, multifaceted dissemination involving faculty workshops and web posting on several sites.

William Erdly

$213,578 National Science Foundation Grant

CPATH Planning Grant

Building a Community to Revitalize Community

This National Science Foundation grant explores barriers and challenges that community college students face when completing core math and statistics requirements necessary to transfer to a four-year technology degree program. A team of community college and CSS students are working on a pilot software development project to create a social network environment -- that also includes core game design elements -- to foster student-centered math communities. It includes different worlds based on math concepts, has math mentors and a "mathatar generator," features topic-specific math chat areas, and contains many different forms of math content that have been submitted by students (and reviewed for quality by faculty and student mentors). This application is now being piloted in three community colleges, supported by UW Bothell student and faculty mentors, to determine its effectiveness in helping students learn math -- and ultimately be successful in computer science programs.

Student Spotlight: Two CSS Students at URS

Allan Ortiz

Cory Mayberry

Held annually, the Undergraduate Research Symposium (URS) is an exciting opportunity for students from all academic backgrounds at all three UW campuses to come together and present their research projects to an audience of fellow students and faculty. We are very proud of our two CSS students, Allan Ortiz and Cory Mayberry, who jointly presented their research projects at the symposium this year.

Can you briefly explain what your research project is about?

Ortiz: Basically, computational neuroscience researchers have an experimental technique in which they grow a culture of neurons on top of an electrode grid. From there, they can monitor and stimulate electrical activity through the grid. We want to understand a specific pattern of spiking behavior that plagues these experimental setups, so we're building a computer simulation to investigate this pattern.

My involvement with the project is fairly specific to solving a large problem that we've ran into: these simulations take way too long to run. Our dilemma has two aspects:

1. Running simulations of the desired magnitude is computationally prohibitive: we're talking about a run time of more than a month per simulation.
2. We don't know the exact configuration that will make our simulator behave like real neurons. This means that before we can even begin our investigation, we need to run some large number of simulations in order to tune the simulator.

Our solution is to use some exotic hardware to accelerate the simulator. Specifically, we're using CUDA capable NVIDIA graphics processing units (GPUs) to handle the bulk of the calculations. Our simulation is 'embarrassingly parallelizable', but only at a one-hundred microsecond time step scale. At each time step, a fair amount of communication has to occur between each of the embarrassingly parallel bits. So, how effective our approach will end up being lies in how much we are able to minimize the parallelization and communication overhead.

What made you interested in this topic?

Ortiz: I've dreamt of endowing computers with general intelligence ever since I was a kid. Today, I can see that this is a really difficult task. One approach to this problem follows the route of replicating the functionality of the human brain. To do this requires that we have a pretty good understanding of how it all works. While I suppose that I'll never understand it all, I can make a contribution.

Mayberry: I became interested in this topic while seeking an independent study class for the Summer quarter on Introduction to Neural Networks from Professor Stiber. He introduced me to a project that he and his previous students had been working on called CSIM. CSIM is a large scale simulator that does more than model the growth of cortical cells. He offered to let me earn credits for undergraduate research. This option fit better in my schedule than taking a course outside of my major or on the weekend.

What did you enjoy the most about your research and why?

Ortiz: I like the challenge. This project has been my first experience with computational neuroscience, so I had to learn a bit about this field before I could really begin. And, I really love designing and implementing high performance systems. It's sort of like building a really massive monster truck, except that we might be able to use this for something that is arguably cooler than squishing cars.

Mayberry: I enjoyed utilizing and applying my knowledge of data structures and software engineering to a project that non-software engineers wrote (CSIM). We explored the benefits and disadvantages of different data structures until we settled on our model.

What did you like least?

Ortiz: After thinking about this one for awhile, I think the biggest problem with my undergrad research is the limited time frame in which I have to work. I would be happy to dig into a project for a year or two, but my role in this project is limited to a two quarter time frame. Once it's over, the project will sit and wait until someone else wants it, and I'll be off to other stuff.

Mayberry: I disliked trying to figure out what the developers of CSIM were trying to accomplish in their code with little to no documentation.

What words of wisdom can you give for students who might be interested in presenting their research projects at future URS?

Ortiz: I suppose that one should keep in mind that the URS is about a month earlier than the end of the quarter, so you'll need to get ready early. And of course, choose a topic that interests you. Don't beat a dead horse, and don't get in over your head.

Mayberry: Document your ideas and save your diagrams, they make writing your abstract and designing your poster easier.

New Degree Programs at UW Bothell

Master of Science in Computing & Software Systems

After many delays, the Computing & Software Systems program is excited to announce the launch of its Master of Science in Computing & Software Systems this Fall 2009. The Master of Science can help launch or accelerate careers in the computing professions. By coupling advanced computing concepts with a broad educational philosophy, students learn to apply software solutions to a wide range of real-world problems. Our graduates will find opportunities for highly paid positions in sectors such as software development, biotech, medicine, aerospace, entertainment, and finance.

The MS in CSS is unique in that it offers advanced studies in computing and software systems for those who have already graduated from CSS, as well as a pathway for career transition students to break into this dynamic field.

Students taking courses in the MS degree will study core topics such as programming methodologies, software architecture, and methods of software development. Career transition students will further supplement their knowledge with background courses such as operating systems, hardware and computer architecture, database systems, and network design. Elective courses will include topics such as computer architecture, artificial intelligence, object recognition, game studies, computer graphics, and much more. As a final requirement, each student completes a substantial thesis or project in direct collaboration with a UW Bothell faculty member.

The MSCSS will be scheduled to fit into the life of a working professional. Classes will be offered on a part-time basis, meeting in the evening twice a week.

Those interested in the MSCSS are encouraged to contact the Computing & Software Systems Program for more details.

Bachelor of Science in Electrical Engineering

Under the leadership of Dr. Arnie Berger, CSS faculty, along with colleagues in other UW Bothell programs, are developing a Bachelor of Science in Electrical Engineering* (BSEE) degree slated to start Fall quarter 2009. Modeled after ABET-approved Electrical Engineering programs, the BSEE Program will specifically focus on meeting the critical needs of technology-dependent employers in the Puget Sound region. The UW Bothell Electrical Engineering degree is designed as a hybrid degree that blends both online courses with courses at the UW Bothell campus to best accommodate working students and students who desire a non-traditional program of study. Following UW Bothell's model of serving part-time and full-time students, courses will be offered in the late afternoon and early evening.

The MSCSS & BSEE programs are currently pending approval by the Higher Education Coordinating (HEC) Board.

CSS Focus CONTINUED

What were some of the things you learned?

Dr. Olson: I think the main things that I've learned are new techniques for feature matching and for determining outliers among the matches found. I'll also be taking away stronger connections with researchers at JPL.

Dr. Fukuda: At each organization I visited, I learned advanced technologies they were using and/or building. At PDM&FC, Lisbon, I learned Ruby on Rails, which were used to develop and make available their Almunsor game program to the Internet. At Keio, Japan, I used their Autonoesis video analyzer. At Basel, I used their ANA system to build an inter-segment UDP-broadcast space as well as a computing-resource potential field where user programs migrate toward their best computing nodes. At UC Irvine, my collaborators are developing a new mobile-agent platform named (JMESS: Java Messenger); a project I am currently involved in.

In what ways has this experience benefited you in your research and/or teaching?

Dr. Olson: Better understanding of this area will definitely benefit my teaching in Computer Vision. I also used a lot of the techniques that I teach in introductory programming classes, so I can also use this experience in motivating and describing concepts for less advanced students. This will also benefit my research, not only through my increased knowledge, but also through expected publication of the results and improved connections with JPL.

Dr. Fukuda: For teaching, I was very impressed by my collaborator's teaching style at Keio University. Assuming that all students carry their notebooks on campus, he blended his lecture and lab session together in class--his students repeated listening to new concepts and immediately began work on hands-on programming problems in their 90-minute class. Since my CSS 342 class for this coming academic year will have approximately 90 students, whom I can give my lecture to in a large classroom but not supervise in a small laboratory, I feel that it would be best to duplicate this style of teaching.

For research, while Keio University and UC Irvine followed authentic research discussions, namely holding a weekly meeting where each student reported her or his progress to others, Universität Basel was carrying out a different style of research discussions. Students, post-doc researchers, and faculty members voluntarily got together for tea break or lunch and exchanged their new ideas and reported progress. Additional meetings and seminars were scheduled if necessary but not regularly. I understand that Basel's research style is feasible only with highly self-motivated students; however I would like to try to build a similar research atmosphere with CSS students here. I feel it would be possible as we welcome a variety of students, such as directly admitted freshmen, transfer students, returning students, and master's students.

Cooperative Education Highlights

Cooperative Education is a capstone senior project required for all Bachelor of Science students. The cooperative education requirement is structured in a way that allows the student to choose the option that best fits his/her educational goals. The following is a short synopsis of what just a few recent and upcoming graduates have done to complete their cooperative education experience.

Anne Trent
KEXP

CONTENT & METADATA SERVICE WITH AJAX

The goal of the project was to create a multi-interface service module for KEXP's playlist. This service would be used to interface metadata on KEXP's songs and playlists with third party content "gadgets" or "widgets". If this service is successful, then other content services for the Web site will be based on it.

Filiz Kurban
MSNBC

U.S. PRESIDENTIAL ELECTION 2008

System/Component Test

Filiz's project involved delivering 2008 U.S. Presidential Election results online at the MSNBC's website with timely, accurate, and easy to understand content. Filiz developed an automated test tool to test the individual as well as integrated components of the system that were responsible for delivering the election results to MSNBC users.

Michael Martin
Scrapeology.com

Mike's project, co-sponsored by Northwest Trends, Inc. and Xtreme Consulting Group, created a Web site which allowed a user to browse and select properties currently listed on the Multiple Listing Service and generate a set of driving directions for a route which approximates the shortest distance between those properties.

RHINOCEROS 5.0 SDK DEVELOPMENT

Neil's project was to fill gaps in the existing SDK for the Rhinoceros 3D modeling application and to prototype a scripting interface to the SDK for the Mac version of Rhino.

Neil Erdman
Robert McNeel & Associates

STUDENT INITIATED SOCIAL LEARNING NETWORK (SISLN)

Implementing Avatars

Warren's internship position in game development/programming was to help develop a virtual world web application focused on bringing community college students together in a creative and exciting new learning forum. Collaboration between the University of Washington Bothell, Bellevue College, Cascadia Community College, and Shoreline Community College in conjunction with the National Science Foundation, Warren's role in the project was to design and develop the application's avatar creation component.

Warren Eng
Faculty Research Internship

DESIGN NEW DATABASE WITH WEB-BASED GRAPHICAL USER INTERFACES FOR PRIVATE INTERNAL DEPARTMENTAL USE

Clifton Dobrich
Edmonds CC

Clifton created a database, with extendibility options and features, for use by departments for equipment tracking. Beyond general database functionality, extra features included more ways to search, schedule, track equipment and collect information from certain network accessible equipment. This information was used to generate usage statistics and also check for needed repairs or replacement. A new web interface to the project was created that works on multiple operating systems in W3C compliant browsers. Clear documentation of the structure, design and inner workings was necessary for when features were added.

INDIE GAME DEVELOPMENT

George Sohal
Individual Project

George started off with a game engine that was built in his CSS 451 3D computer graphics course and created an online strategy game supporting 4-10 players. The project required a lot of game engine design/ programming and class abstractions to support a multitude of features. The design for the game itself followed an integrative approach.

REMOTE SERVICES NETWORK

Systems and Application Management Page

Richard Ness
Philips Healthcare

Richard's project was to add functionality to the Remote Services Network (RSN) which connects all Philips Medical equipment back to Philips for failure isolation, diagnosis, repair, and data logging. The RSN is an integral part of Philips Global Customer Service group. To add value to the RSN, this project simplified and automated functions that were currently being manually updated into databases. Functions being automated were adding new systems and applications to the RSN core database. The project was handled with full-blown documentation and software lifecycle from requirements gathering to delivery according to Philips documentation and lifecycle requirements.

William Thompson
Microsoft

EXCHANGE 2007 HUB/ CAS COMBINED SERVER SCALABILITY TESTING

Bill's project was to provide guidance and scalability on the deployment of Exchange 2007 with both Hub Transport (HT) and Client Access Server (CAS) server roles. The major goal of the project was to determine if combining server roles can reduce total cost of ownership.

GAME DEVELOPMENT INTERNSHIP

Chris Eng
FuelCell, LLC

Chris developed an action-adventure video game at FuelCell Games in Seattle, WA. He contributed to the game by developing tools for the artists; creating game behaviors and physics; debugging and testing the game; and participating in overall game design.

EL-MEMS DATA LOGGER MANAGER

James McCool
Durham Geo Slope Indicator

Jim's project was to design and develop a user interface (UI) to communicate with a data logger device. The application supported regionalized date and number formats for international distribution. The architecture maximized code and design reuse by placing base classes common to all data devices in a Dynamically Linked Library (DLL). Device specific implementation was in a second DLL. The UI used forms that worked on the base classes, with additional forms for working with device specific options.

Thanks to Our Donors!

The CSS Program is very fortunate to have generous alumni and friends who direct their UW gifts to us. Listed below are our benefactors for this year. Support like this helps us to sustain program operations and events and attract outstanding students and faculty, making CSS a unique and rewarding experience and an important part in the area of computing profession.

Mr. Richard and Jennifer Beers (BS '03)
Mr. Jonathan Dawson (BS '03)
Mr. Duncan Smith (BS '05)
Mr. William Frankhouser (BS '06)
Ms. Michelle Gamboa (BS '05)
Ms. Dana Good (BS '05)
Mr. Randal and Maggie Taylor (BS '04)
Ms. Eiko Toguchi (BS '01)
Drs. Charles and Susan Jackels
Dr. Kelvin Sung
Microsoft Corporation

You can direct your UW giving to CSS by visiting www.uwb.edu/css and clicking on the "Make a Gift" link.

Thank you for your support!

New!

Master of Science in Computing & Software Systems

In Autumn of 2009, we will be launching our new Master of Science in Computing and Software Systems (MSCSS) degree.

You can learn more about this new and exciting degree program by reading the "New Degree Programs at UW Bothell" article in this issue of our newsletter or by either calling or emailing our CSS office to schedule an appointment with one of our advisors.

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