Online Proceedings

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Data Analysis and Computation Improve Daily Life

Session Moderator: Werner Stuetzle, Statistics

Mary Gates Hall 258

3:30 PM to 5:00 PM

* Note: Titles in order of presentation.

Energy Saving Butler

Justin Thomas (Justin) Brown, Junior, Extended Pre-Engineering
Austin Christopher Briggs, Junior, Pre Engineering
Tariq Yusuf, Junior, Extended Pre-Major
Antonius Denny (Denny) Harijanto, Junior, Computer Engineering
Jun Sang Yoo, Sophomore, Chemistry
Robert Paul (Robert) Vienneau, Senior, Electrical Engineering
Mentor: Daniel Kirschen, Electrical Engineering

As consumers continue to face high energy bills and the efficient use of resources becomes vital to the sustainability of modern society, the need for a device to intelligently manage electricity consumption grows. The Energy Saving Butler, a computer system to be installed in homes and workplaces, seeks to meet this need by simultaneously minimizing the cost and unnecessary use of electricity–all without inconveniencing the users. The Butler is true to its name: acting behind the scenes and within the confines of the household's schedule, while working to allocate electricity efficiently and discreetly. Our team has conceptualized the features and functions that will drive the future technical design of this device. Based on data from the power company and data on appliance use, the Butler can delay or initiate tasks, such as laundry and dishwashing, so that they occur at times where power rates are at their lowest. Using a complex and dynamic priority level system, this control of power allocation is designed to work within the user's schedule. If the user is having a dinner party one night, for example, the Butler will automatically suspend its own activities so as to not interfere with any social functions. If that user also finds his or herself driving home on a cold night, that user's smart-phone can notify the Butler when it is within a 10-mile radius, so that the Butler can turn on the home's heating. With these and a wide array of other practical features, we feel that the Energy Saving Butler will go a long way in saving consumers' money and working to stabilize the over-burdened power grid. It's appealing to the consumer; it's appealing to the utility companies; it's a step in the right direction for a more sustainable society.

Computational Photography for Greater Accessibility

Josh Scotland, Senior, Computer Science, Business Administration
Mary Gates Scholar, NASA Space Grant Scholar, Washington Research Foundation Fellow
Mentor: Richard Ladner, Computer Science & Engineering

Cameras have become a fundamental part of our daily lives because of the powerful ability of images to communicate, preserve, and educate. Computational photography is an emerging field of study that considers sensory information from a scene to be intermediate data, and uses computation to form the final photo. The goal is to improve images by combining computing power with digital imaging to create new images that no digital camera on the market today could capture. Techniques that represent computational photography include high-dynamic-range (HDR) imaging, panoramic stitching, and light-field imaging. Last year, Andrew Adams, a leading Stanford researcher behind computational photography, released a fully programmable digital camera system to aid other researchers in computational photography. Named FCam, it is an open-source C++ application programmable interface (API) for easy and precise control of digital cameras. My research will focus on using the FCam API to develop faster, smarter algorithms to capture images for accessibility purposes. Computational photography can be directly applied to several accessibility research projects. The project I am currently working on improves the visibility of street signs so that another person or a computer can recognize the text. By quickly capturing multiple images with different levels of luminosity, an optical character recognition engine can provide better textual results to the user. This research demonstrates the importance of using computational photography to make information more accessible to people

with disabilities.

TapData: Taking Research Outside The Lab
William Charles (Will) Beebe, Senior, Informatics (Human-Computer Interaction)
Tanner Curtis Means, Senior, Informatics (Information Architecture)
Brent Michael Grossman, Senior, Informatics (Human-Computer Interaction)
Mentor: Jacob Wobbrock, The Information School

Touchscreen technology has progressed considerably with the continued innovation of touchscreen devices, yet the development of interaction techniques has largely stagnated. If touchscreen devices are going to become more than just a novelty, new interaction techniques that allow users to be more efficient are necessary. This study examines three input techniques of 'right clicking' on touchscreens: (1) a long press, (2) a double tap, and (3) a two-touch. To test these three input techniques we introduced a new method of data collection, consisting of incorporating research that might be done as a lab experiment into a publicly available video game. Our method features the deployment of an Android game that records the accuracy and speed of a user, and is specifically designed to challenge the user's precision and interaction with their device. The input techniques are measured quantitatively by speed and accuracy for each trial. Qualitative data is collected by a survey, which is proposed to the player after a considerable amount of play time. A statistical evaluation of our results show that the double tap input technique was more accurate and faster than the other techniques (Paccuracy=X, Pspeed=Y). Our research concludes with a set of design implications for touchscreen interactions as well as comments on the validity of our public-oriented research method based on the findings presented.

Using Computing Tools to Enhance Online Instruction
Mitchell Harland (Mitchell) Erickson, Fifth Year, Computing & Software Systems, UW Bothell
Mentor: Mark Kochanski, Computing and Software Systems, UW Bothell

My study focuses on the effects of replacing static content with dynamic content in online courses. The written word is an example of static content found as the main, or only, content in many online courses. However, much of the content of a face-to-face class is delivered to the student in dynamic form, and this content is often not replicated in an online course. My hypothesis is that adding dynamic content, such as animated drawings and interactive web applications, to online courses will improve student learning and involvement. To measure the effectiveness of adding dynamic content, I am developing applications that can model the dynamic content used in face-to-face classes. I am using two types of courses in this study, each with a number of instances (or quarters). Ten instances of past quarters, where the classes had no dynamic content are used as base cases. Five instances of past and present courses with dynamic content added are being used as test cases. The data gathered from all instances are median grades, evaluation rubrics of student written material, student surveys, and counts of student visits to online content pages. The data will measure whether or not student grades improve, whether or not the quality of student written responses improve, how much time students spend engaged with dynamic content, and whether or not students view the dynamic content as valuable to their learning and involvement. As this study continues, additional issues about dynamic content in online courses emerge, such as: 1) What is the limit to adding online content such that it becomes too much for the student to attend to? 2) How are different models of online instruction best enabled with dynamic content? 3) What are the effects of replacing large extents of written content with dynamic content?

A High Level Assessment of Risks Associated with Enterprise Voice over Internet Protocol Deployment at the University of Washington
D.C. Grant, Senior, Information Technology (Tacoma)
Mentor: Marc Dupuis, Computing and Software Systems, UW Bothell

The University of Washington Tacoma is considering a change to the campus telephone system. The current Avaya Private Branch Exchange (PBX) switch system is aging and inadequate for future expansion. The University is considering the implementation of a Voice over Internet Protocol (VoIP) system. This work briefly examines potential risks and rewards related to the implementation of VoIP phones. Initial considerations include the risks of inaction, as opposed to the risks of a large scale VoIP implementation. The main component of this work is related to the potential pitfalls and benefits of VoIP telephony. Of the many possible issues and benefits related to implementation of VoIP, only a few can be considered risks which are directly related to replacing a traditional PBX telephone switch with VoIP. Those specific risks are evaluated qualitatively; the qualitative data is then used to create a quantitative analysis. The quantitative data is used to perform a Monte Carlo risk simulation using the software tool ModelRisk version 4.3 by Vose Software. Conclusions include recommended actions to reduce the probability and impact of potential risks which are most relevant.