Proceedings of the Fifth Annual Virginia Tech Center for Human-Computer Interaction

Research Experience for Undergraduates (REU) Symposium

July 8, 2010
5:00-7:00PM
106 McBryde Hall

Virginia Tech's Center for Human-Computer Interaction presents the project abstracts for the REU 2010 symposium. The REU (Research Experience for Undergraduates) program provides undergraduate students from various universities with the opportunity to spend eight weeks at Virginia Tech, working with our faculty and graduate students on research projects using the state-of-the-art technology and laboratories assembled here. The REU program is sponsored primarily by the National Science Foundation (IIS-0851774, IIS-0552732). Additional support was provided by the NSF (CNS-0540509), the VT CS Department CSRC, and IBM Research.

Table of Contents

hci-reu 2010

hci-reu 2010

Exploring Mobile Technologies in Health and Wellness Promotion in the African-American Community: A Demonstrative Effort

Jasmine Blunt, Donovan Hill, Monika Monk, and Terrence Pugh
Mentor(s): Woodrow Winchester, Scott McCrickard

In the African-American community, there are a growing number of life-threatening diseases that can easily be prevented with a healthy diet and exercise. Some of these diseases include heart disease, cancer, and diabetes (www.cdc.gov/omhd). These diseases have been linked to the preparation of certain foods known as "Soul Food" (www.netwellness.org). To counter this epidemic, this iPhone application will be used as an intervention program. Because of the increase in the use of technology over the years, this application, known as "Health Attack", is being applied to see if one's culture affects how a user relates to a program and the effectiveness of the program. "Health Attack" will help teach children, from ages 7-11, about nutrition while allowing them to have fun. In addition, "Health Attack" is a memory game which takes common foods found in the African-American community and puts them in their respective places in the food pyramid. It also has the healthy and unhealthy aspects of each food. In the backgrounds of the game, there are several African-American role models that are there to help the children relate more to the game. For future versions of the game, we will have background music, a recipe journal, and a more intense game.

Designers' Perspectives on Storyboarding & Reuse in PIC-UP

Nina Elias
Mentor(s): Shahtab Wahid, Scott McCrickard

Designers naturally have a tendency to reuse previous designs in new creations. Often new concepts are represented in the form of a storyboard. Thus, a tool that can facilitate reuse during storyboarding would be beneficial to designers. PIC-UP is a digital storyboarding tool that contains reusable features in the form of cards featuring a description, image, and tradeoffs. The goals of this research were to identify when designers would utilize the tool in their design processes, what they would use it for precisely, and how they would utilize the completed storyboards.

Interviews were conducted with six designers with significance industry experience and researchers--all with exposure to Human Computer Interaction. Participants answered questions about their typical design processes, reuse practices, and thoughts on storyboarding. They also provided feedback on PIC-UP after a brief introduction to the tool and followed a sample scenario guiding them through the design of a museum notification system. Using the Grounded Theory method to analyze the interview results, we found that PIC-UP is useful in initial stages of design work and could be useful for designers with various levels of expertise. In unfamiliar domains, the tool can inspire and encourage discovery; but in general, the likelihood of tool adoption might depend on having a set of artifacts tailored to the designer's specific domain. We also found that PIC-UP might allow designers to more effectively communicate and capture design ideas, but that specific features and methods of output would have to be added.

Adaptive Information-Rich Interfaces: Neural Correlates of Cognitive Integration Using EEG

Elizabeth Yost
Mentor(s): Nicholas Polys

While computers can provide very efficient computational processes for solving complex problems, they cannot match the human's abilities for pattern-recognition and creative reasoning. It is essential that next-generation interfaces make use of these strengths of the human operator in order to create more useful tools for analysis and decision-making. In order to create such a system, we need a better understanding of cognitive processes. It is already known that different brain circuits are used to processes different cognitive tasks such as the verbal (what) versus spatial (where) pathways. This research makes use of electroencephalography (EEG) and information-rich virtual environments (IRVEs) to discover patterns of neural activity that correlate with these distinct processing methods. With this knowledge, we can create systems that respond in real time to a user's cognitive state and task intention.

Studying Driver Route Choice Using a Physics Based Driving Simulator

James Pendergrast
Mentor(s): Nicholas Polys

We would like to discover how drivers choose routes and what factors affect their route choices. Understanding how drivers choose routes will allow the development of better traffic models and make it easier for computers to give drivers information relevant to their route choices. Simulators have advantages over real-world driving in that simulation is cheaper, safer, and easier to repeat than a real-world driving study. In this research project we developed a physics-based driving simulator using X3D with the Open Dynamics Engine for physics. The simulator models vehicle acceleration, resistance, braking, and steering with parameters that may be set to simulate different vehicle types. Users will be asked to compare the realism and feel of different control models. In the future, the driving simulator will be integrated with a traffic simulator so that we can observe drivers' behavior and route choice in realistic driving situations.

hci-reu 2010

Field Study of In-Use Information Security Within Medical Practices

Aubrey Baker
Mentor(s): Laurian Vega, Steve Harrison

Medical information systems are rapidly changing with the introduction of new technologies. Our research goal is to make incoming systems more responsive to actual practices of medical offices and preexisting medical information systems. To do that, we have conducted a study in small medical practices in the New River Valley area. This work built upon a study conducted in fall of 2009, which interviewed staff and physicians in small practices. From the previous work, we determined that there are many places information is coordinated between records and systems. There may be special cases; we aimed to better understand them by observing those cases directly. We looked at five medical practices, conducting observing 3-hour long observations at each, and conducting interviews of staff members at several of the locations. Thus far, we have found that medical staff members spend a significant amount of time finding, sorting, and distributing paper files using current paper based system. Additional disadvantages of paper-based systems exist, such as security risks due to non-employee access to rooms where files are stored. Additional time is lost due to the constant communication of data between several parties, such as patients, primary healthcare provider, specialized physicians, and insurance companies. We intend use this data to prototype an electronic medical record system that eliminates these security risks and streamlines information flow.

Co-Located Collaboration on a Large, High-Resolution Display

Katherine Vogt
Mentor(s): Alex Endert, Christopher Andrews, Chris North

Collaboration throughout the sensemaking process can provide increased insights and more efficient interpretation of data. Large displays support collaboration through the increased size and ability to visually present large amounts of information. A multiuser workspace is created by adding support for the simultaneous use of multiple personal input devices. We have observed how a large, high-resolution display and multi-mouse environment facilitates the co-located, collaborative sensemaking process. With a study that presents pairs of users with the task of textual analysis, we examined the user roles adopted throughout the varying collaborative processes. Additionally, we analyzed the organization of the space, and perceived ownership or sharing of territory on the display. Furthermore, with the field of visual analytics and a multi-mouse environment in mind, these findings will lead to design implications of software.

Multi-touch Tables for Collaborative Learning

Jacob George, Desiree Dorsey, Eric de Araugo
Mentor(s): Greg Wilson, Scott McCrickard

The user interface provided by multi-touch technology has great potential for early education, as a large multi-touch surface or tabletop would allow multiple students to collaborate and perform tasks via gestures and actions. While such commercial devices exist, their high cost, low portability, and lack of modularity hinder their adoption in classroom settings. To address these issues, we created the Multi-touch Educational Table (MET), a portable hardware system and virtual card game suite targeted for use in elementary education environments. The projection based MET uses Frustrated Total Internal Refraction (FTIR) to achieve its multi-touch capabilities and costs under $3,000. It is possible to share the MET between classrooms as it easily disassembles into lightweight components that can then be transported independently.

Children interact with digital cards on the MET through customizable linking and pairing games, created in part through a formative intervention with 14 elementary school children. Associations between elements in the games are made using four interaction gestures: linking, combining, sequencing, and mapping. The games support both collaboration and competition among students, empowering teachers to tailor them to the lesson plan and classroom style. Under way is a laboratory study to explore how multi-touch technology can serve as a learning tool to provide advantages over existing technology.

hci-reu 2010

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We thank all of our REU in HCI 2010 Scholars for their hard work and successful completion of the program, and we send best wishes for their future endeavors.