Creativity in User Interface Design

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Abstract

Creativity and issues of creativity pervade the field of HCI and UI design. In my teaching and research at the UO, my collaborators on campus tend to be in music and the arts, not in computer science or psychology. This position paper will discuss a number of projects in which I am involved. These projects are specifically designed to promote, engender, foster, and exercise creativity. The projects include making music with eye movements, drawing pictures with eye movements, supporting creativity in children with severe physical disabilities, and a variety of collaborative activities with faculty in our digital arts program.

Keywords

Accessibility, art, creativity, user interface design.

ACM Classification Keywords

H.5.2 User Interfaces; J.5. Arts and Humanities.

Creative Engagement

Though there is a great deal of creativity involved in science and engineering, the creativity is sometimes less tangible to an outside observer. The myriad experiments that *failed*, for example, are not discussed in the literature. Attending an advanced graduate seminar with highly-published Psychology faculty here

at the University of Oregon (UO), a major theme of discussion is how to set up an experiment to test a variety of specific hypotheses. Many aspects of creativity are there: Brainstorming, generating multiple possible solutions, critiquing, editing. "Wild ideas" are often proposed, and rewarded. Though the activity would appear to be very constrained and perhaps even dull to some observers, it is clear that the faculty and graduate students greatly enjoy this activity and that there is a currency in developing a personal "artistic flair" in the design of experiments, and even in the analysis and reporting of experimental data. It is clearly a creative process. Surely these activities take places in all of the sciences, including in human-computer interaction (HCI) research.

The creative aspects of user interface (UI) design are perhaps more tangible and readily discerned. There is a close relationship between UI design and the activities of product design, architecture, graphic design, and other visual design and artistic endeavors. Nonetheless, especially when teaching UI design in a computer science department, where perhaps a large percentage of such classes are taught, it is being presented in a tradition of the sciences, in classroom settings rather than studio settings that are more familiar to art, design, and architecture students.

EyeMusic

EyeMusic [3] is a performance piece that explores how eye movements can be sonified to show where a person is looking using sound, and how this sonification can be used in real time to create music. The project started as a collaboration with Dr. Jeffrey Stolet, a chaired Professor in Music Technology and the director of the computer music program in the UO School of Music and Dance. The project has also involved an undergraduate student in computer science, as well as a Master's student in computer music and intermedia music technology here at the UO. EyeMusic v1.0 will be performed at the annual conference of the Society for Electro-Acoustic Music in the United States (SEAMUS) 2006.

EyeMusic provides a unique physical interface to an electronic music composition. An eye tracking device (the LC Technologies Eyegaze Communication System) reports where the performer is looking on the computer screen, as well as other parameters pertaining to the status of the eyes. The eye tracker reports these data in real time to a computer program (written using Max/MSP/Jitter). The computer program generates and modifies sounds and images based on these data.

The development of EyeMusic has been a creative collaboration between computer scientists and electronic music composers and musicians. A particularly interesting aspect of the collaboration is how participants from both disciplines have had to learn a fair amount of what constitutes creative expression in each other's field. The computer scientists, for example, have learned that electronic musicians sometimes have deep theoretic concerns regarding the processes used to generate sounds in a computer music composition. Digital sampling has a specific theoretic role, for example, and its use constitutes a specific theoretical position. The computer musicians, on the other hand, were new to the concept of storyboarding as a means of narrating a user's or a performer's experience when interacting with a computer.

EyeDraw

EyeDraw [2] is software that enables children to draw pictures by just moving their eyes, and is designed for children with severe motor impairments who have no other means of drawing pictures. User observation studies with nondisabled children demonstrate that EyeDraw works, is easy to use, and enables children to draw pictures by just moving their eyes. We user-tested EyeDraw with disabled children at five homes and clinics across the country to verify that the software works with its intended audience. EyeDraw has been featured in newspaper articles, radio shows, and television news stories.

It has been observed throughout the world that children naturally progress through a series of creative stages when learning to draw with paper and pencil: random scribble, controlled scribble, basic forms, early pictorial, and later pictorial [4]. Children follow the same stages of creative development when learning to draw on computers [1]. Previous research suggested that important developmental processes could be achieved through drawing with the eyes, and provided a taxonomy and framework that we used to insure that EyeDraw would the natural progression of learning to draw. User studies demonstrated that EyeDraw supports the open-ended creative processes such as that of visual artistic composition to enable people with severe disabilities who are currently locked out of fundamental human creative and expressive opportunities to experience more of what life has to offer.

Supporting Creativity in Children with Severe Physical Disabilities

Here at UO, we are currently engaged in a project in which we will further explore ways in which children with severe disabilities can express themselves creatively and artistically with their eye movements. This requires us, to some extent, to conduct requirements analysis and decompose the process of creative expression so that it can be supported step by step using software designed for control with an eye tracker. The National Science Foundation has awarded UO with a small grant for exploratory research (SGER) to explore this opportunity. The grant is entitled "Collaborating with Children with Severe Disabilities in the Design of Eye-Controlled Software." I am the principle investigator on the grant.

For people who have severe physical disabilities but retain control of their eyes, eye tracking provides a powerful and noninvasive opportunity for creative expression. Despite the remarkable opportunity afforded by eye tracking technology, eye-control of computers is still very limited. The design space for eye-control of computers has not be thoroughly explored and tested in part because the discrete human-computer events around which eye-controlled applications can be constructed are not yet known. Most eye-controlled software works by having the user move the mouse cursor with the eyes, looking at buttons to click on them. Other control and feedback techniques are needed to support a range of creative activities. There have also been few attempts to involve people with severe motor impairments as design partners in participatory design projects to develop eye-controlled software that is designed to

support creative expression. There is a special need to help young children who, because of severe physical impairments, are locked out of activities that are critical for creative, social, and emotional development.

Collaborating with Digital Arts

I have been involved in a number of collaborative activities with a variety of faculty in our Digital Arts and Visual Arts departments. For example, we have joined and team-taught courses on communication design (from Digital Arts) and user interface design (from Computer Science). There have also been numerous less formal collaborations, including Digital Arts classes visiting my lab to see and discuss various creativity-related projects, and numerous round-table discussions with arts faculty on topics such as the tension between design for aesthetics and design to support human tasks. I do believe that I have some credibility with my colleagues in the arts departments regarding my appreciation and perspectives on these matters, in part due to some (at least armchair) fluency in art and architecture, and having done some painting of my own. My work has been featured in juried group shows in New York City, and in private galleries.

My View on the Workshop

This workshop is timely and appropriate. Creativity is a currency that is critical and highly-valued, yet intangible. It is difficult to measure, identify, or teach. Evidence of its value, for example, is in the sometimes-made criticism that work is "derivative," implying that the artist (or other creator) did not successfully exercise or demonstrate creativity. I believe that this discussion of creativity, specifically in the context of the many ways in which it relates to HCI, UI design, and new media, will help to clarify its identification, exercise, and teaching. Incorporating computers into music, art, and new media opens the door for a wide range of new expression.

Sometimes the presence of the computer is more visible and prominent, as in Tim Hawkinson's mechanical sculptures such as *Emoter* (2002) in which a computer slowly moves around pieces of a face. Sometimes the computer is entirely behind the scenes, and gone by the time that the piece is presented, as in Robert Lazzarini's distorted objects such as a *Payphone* (2000) which is very precisely pulled along a diagonal dimension. New opportunities abound for exploring creativity through new media arts and HCI.

Acknowledgements

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References

[1] Escobedo, T. H., & Bhargava, A. (1991). A study of children's computer-generated graphics. *Journal of Computing in Childhood Education*, 2(4), 3-25.

[2] Hornof, A. J. & Cavender, A. (2005). EyeDraw: Enabling children with severe motor impairments to draw with their eyes. *Proceedings of ACM CHI 2005: Conference on Human Factors in Computing Systems*, New York: ACM, 161-170. Available as a PDF file.

[3] Hornof, A., & Sato, L. (2004). EyeMusic: Making Music with the Eyes. *Proceedings of the 2004 Conference on New Interfaces for Musical Expression (NIME04)*, Hamamatsu, Japan, June 3-5, 185-188.

[4] Kellogg, R. (1970). *Analyzing Children's Art.* Palo Alto, Calif., Mayfield Pub. Co.