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The Journal of the International Digital Media and Arts Association

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Ideas for the Future Conference Issue

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Submission Guidelines

Articles on digital media and art related topics are welcome at any time. An abstract of not more than one page should be submitted to the editor via e-mail (mniederman@colum.edu). Please include “iDMAa Journal Submission” in the subject line.

Upon review, authors will be advised of acceptance for submission. The Journal will include a section for invited and refereed articles. While length will vary from issue to issue due to themes, articles will generally be 1500 to 4000 words. Any author preferring a peer review will automatically have the submission considered for the refereed section of the Journal.

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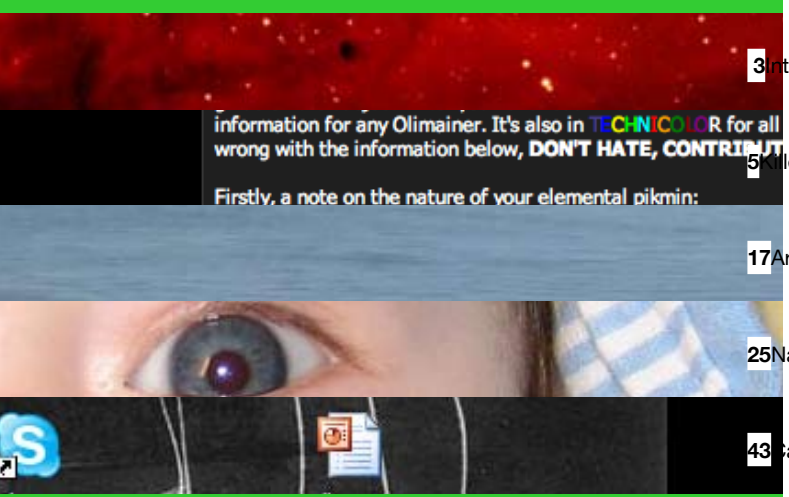
Table of Contents



keywords:

past, present, future, iDMAa conference, hippies

Jeff Ritchie

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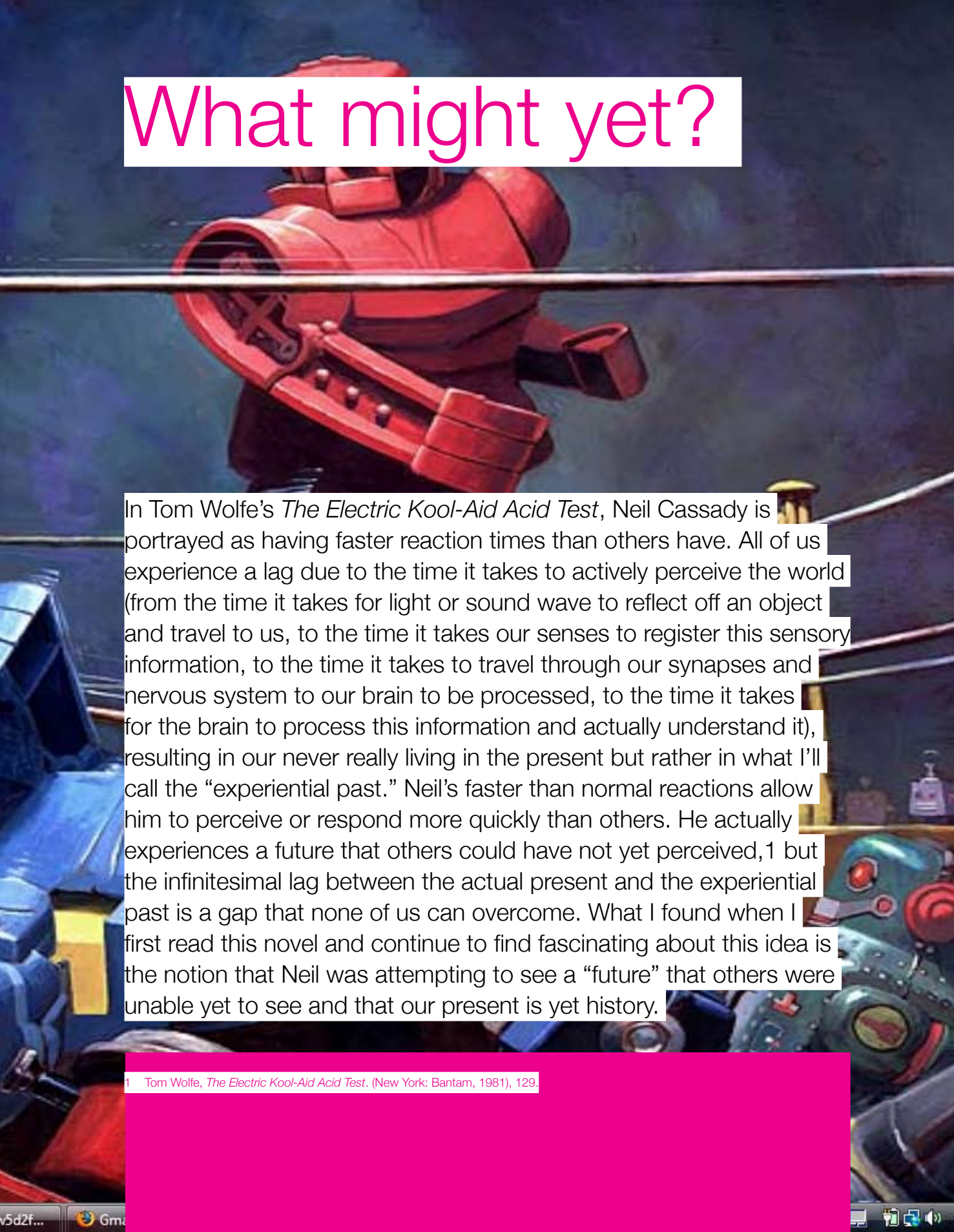

What might yet?

In Tom Wolfe's *The Electric Kool-Aid Acid Test*, Neil Cassady is portrayed as having faster reaction times than others have. All of us experience a lag due to the time it takes to actively perceive the world (from the time it takes for light or sound wave to reflect off an object and travel to us, to the time it takes our senses to register this sensory information, to the time it takes to travel through our synapses and nervous system to our brain to be processed, to the time it takes for the brain to process this information and actually understand it), resulting in our never really living in the present but rather in what I'll call the "experiential past." Neil's faster than normal reactions allow him to perceive or respond more quickly than others. He actually experiences a future that others could have not yet perceived,1 but the infinitesimal lag between the actual present and the experiential past is a gap that none of us can overcome. What I found when I first read this novel and continue to find fascinating about this idea is the notion that Neil was attempting to see a "future" that others were unable yet to see and that our present is yet history.

1 Tom Wolfe, *The Electric Kool-Aid Acid Test*. (New York: Bantam, 1981), 129.

As an academic, I'm comfortable with this "experiential past" as, like many other academic disciplines, most of my work seems to concern itself with critiquing an artifact.

Through differentiating between ideas for the future and those for the present and the past, the connotation of the conference's theme seems to get at the frenetic drive of Neil Cassady's character. The future, an unobtainable ideal, is never actually experienced – when tomorrow comes it's today – and on an experiential level the only reality we know is an ephemeral present that we think we are experiencing yet is actually located in the experiential past due to the above mentioned physiological lag in perceiving and processing information.

As an academic, I'm comfortable with this "experiential past" as, like many other academic disciplines, most of my work seems to concern itself with critiquing an artifact. In focusing on an artifact, the work of criticism neither focuses on the future nor really on the present, but on the past and is by its nature just as much an historical artifact as the artifact itself. I'm sure that exceptions exist in fields in which practitioners and scholars attempt to predict outcomes based on hypotheses – but though they predict – an act by its nature focused forward on the future – what they usually measure is in the past. The future, an unobtainable goal, always slips out of reach and the past dominates our work and our understanding of the future – and the present. The past lives in memory, record, artifact, and effect.

Yet what complicates my idea of an unobtainable future is that designing for interactivity (in all of its degrees and guises – be they in business, services, manufacturing, public policy, or digital settings) requires understanding, predicting, and then designing and developing potential actions/interactions. Granted, to create a technology or an object is ironically an historic act. The potential interactions and influence held by such creations – the fact that people may one day interact with these creations in the future – when this interaction is realized – is always in the experiential past. However here I find an idea that is particularly relevant to the conference theme – ideas for the future – for designing interactivity is forward looking, even though the artifacts created are in the experiential past. It's not really that we interact with or experience the future, but that we plan for these future interactions.

Because we are at play in the fields that comprise digital media and arts – or training those who will take part – we are in a position to design and develop future interactions. And while in some ways the notion of influencing or building the future is patently absurd – who doesn't build or plan for the future? – iDMAa's constituents are in many ways at the center of both a grand act of understanding what it is that we're doing with digital media and arts and a reimagining and building of a future based on what we've come to know about digital media and art. We're in a good place to understand what has happened and shape what is to come.

The art described in Eber's article or Cliquet's idea of datatainment both detail historical phenomena, yet these historical documents may in some small way allow us to imagine or predict better what might yet be. Petite, Dinh, and Fisher's article "Towards a Transmedia Search Engine: A User Study on Perceiving Analogies in Multimedia Data" illustrates their movement toward refining search engines that extend beyond textual and metadata searches and constitutes a vastly different way in which data on the internet can be used. O'Neil's paper on "Remix Identity" "interprets the superabundance of video mash-ups (the remixed/repurposed media creations that have made YouTube iconic) as a generational, aesthetic response to identity crisis." George-Palilonis, et al, document their past struggles with teaching students how to create new interface designs for delivering news to mobile phones in their paper "Research Informed Design." Nyhoff's paper "Performing the Interface" expands upon historical discussions of the theatricality of the graphical user interface. And Burg, et al, detail ways in which educators might better incorporate sound into digital media courses. All of these papers deal with past patterns, trends, objects, or ideas, yet all can help us better chart out our own future interactions, ideas, and projects.

In a world defined by rapid change, like the odd figure of Neil Cassady we need to reduce the lag in how quickly we understand and react to this change. For those curmudgeons out there, we actually can learn something from Beatniks and Hippies. Often we are either unable to see the pattern of changes unfolding around us or choose not to question the paradigms of our world, yet all of us would agree that we have to understand the past and see beyond paradigmatic thinking in order to understand what is actually happening and successfully plan for the future. I trust that you might think, as I do, that the annual iDMAa conference and these conference proceedings can provide us with the means of readily understanding both what has occurred and what might yet.

Works Cited

Wolfe, Tom. *The Electric Kool-Aid Acid Test*. New York: Bantam, 1981.

keywords:
digital audio, MIDI, digital media, digital art, curriculum, sound art

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Jennifer Burg is a Professor of Computer Science at Wake Forest University. Having received Master's degrees in English and French, she returned to school after eight years of teaching to re-educate herself in computer science. She received her PhD in computer science from the University of Central Florida in 1993. Her research is in digital media and curriculum development for interdisciplinary courses. Her textbook, *The Science of Digital Media*, published in 2008 by Pearson/Prentice-Hall, covers digital imaging, audio, video, and multimedia programming. She is currently working under two NSF grants: "Revitalizing Computer Science Education through the Science of Digital Media" with Conrad Gleber of La Salle University; and "Linking Science, Art, and Practice Through Digital Sound" with Jason Romney from UNCSA.

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Integrating Sound into a Digital Media Course

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Abstract: Sound is sometimes neglected in digital art programs, visual art being the traditional focus. However, visual artists might be willing to incorporate more sound and music into their courses if they were shown a “quick-start” way to integrate a second medium. This paper provides such a quick start in five areas: a rationale for including digital sound in digital art courses; suggestions for conceptual approaches that view “sound as art” as well as “sound in art;” the software and hardware tools required if you want your students to do hands-on work, including low-cost solutions; an overview of the technical concepts fundamental to digital sound; and ideas for assignments that encourage students to experiment creatively.

Why Include Sound in Digital Art?

Art departments in colleges and universities have traditionally divided their curriculum between art history and studio art, the studio art portion being devoted to drawing, painting, sculpture, printmaking, photography, and other visual media. Since the 1970s, however, as the computer has offered an increasingly attractive toolkit for artists, digital art has become another important component of many art programs.

It's not surprising that digital art courses and programs – growing out of departments with a visual emphasis – might first focus on digital picture-making – digital photography, photographic processing, vector graphics, and paint programs. From these beginnings, the curriculum might go on to 2D animation and digital movie-making. Sound, however, is generally not a focus. Sound seems to be a more technical matter, the province of the engineer rather than the artist. Thus, sound often takes a backseat to the visual in digital art programs.

There are advantages, however, to introducing sound into digital art, even at early stages in the curriculum. Like image-making, sound can be studied historically and conceptually, and analogies between sound and visual art help to reinforce learning in these areas. In an historical approach, students can learn about the emergence of sound as one more technologically-based element of art, greeted with the same artistic skepticism that greeted the advent of photography. This can lead students to question the artistic principles guiding technologically-based art and the ways in which a new medium develops its own vocabulary and aesthetics. Considering these issues in more than one context – the visual and the aural – reinforces the students' understanding and analytical ability.

The creative spaces in which digital pictures and sounds are edited also have parallels. For example, the difference between bitmap imaging and vector graphics is analogous to the difference between sampled digital audio and MIDI. Furthermore, the software interfaces for photographic processing, vector graphic drawing programs, and sound editing use similar terminology and metaphors. In imaging software, channels are color components that are mixed together in one pixel (e.g., RGB), while in audio software, channels refer to sound components that are mixed together at one moment in time (e.g., stereo). Layers in imaging software are analogous to tracks in audio software. Flattening an image's layers is analogous to mixing down an audio file's tracks. These analogies, again, reinforce student learning.

Another advantage of including sound early in the digital art curriculum is that it introduces another dimension into the students' creative space – the dimension of time. While paintings, photographs, and their digital equivalents are static, sound is dynamic. Introducing the temporal dimension by means of sound prepares students for 4D design in digital video and animation, where timelines are a fundamental component in the software interfaces.

It isn't difficult to be convinced of the value of sound in digital art courses, but sometimes the bar to including sound is simply that the faculty in a given art department have always worked in the visual arts. This is where their interests and talents lie, and they don't relish the thought of retooling their labs and assignments to incorporate another medium. But retooling may not be as hard as it first appears, as we'll try to show in what follows.

What Conceptual and Historical Background Is Relevant?

One way to approach sound, conceptually, in a digital art course is to view it from two perspectives: "sound *in* art" and "sound ***as*** art." Viewing sound from these perspectives, possibly in an historical overview, can motivate students for experimentation in their own work.

"Sound *in* art" refers to sound as one component of an artistic piece, like sound in a movie, in a theatre production, or combined with still pictures used to illustrate poem or short story. Sound made a major appearance in art when it was first introduced into movies. Just when silent cinema had gained some respectability as an art form, sound arrived and changed all the rules. The reaction to any new kind of technologically-based art is basically the same – skepticism about its artistic legitimacy and a protectiveness of the uniquely human ability to create true art. With the invention of the camera, objections were made to photography-as-art, on the one hand because of the camera's mindless literalism and on the other hand because of its potential for serendipitous success if a person simply takes enough pictures. Sound in the movies raised similar objections. The first uses of sound in movies were fairly literal and predictable. Pioneering sound artists devoted much of their attention to dialog and the technical challenge of synchronizing lips with voice. These new movies were, after all, called "the talkies." The next obvious thing

was to create realistic sound effects. An image of a clock called for a "tick tock," and clapping hands called for the sound of applause.1

It was quickly realized that sound had much more potential than that. An interesting discussion of sound's expressiveness appeared in a 1929 article by René Clair, where he described a scene from the movie *Broadway Melody*. In the scene described, sound clarifies meaning, freeing the images to maintain their artistic unity.

…we hear the noise of a door being slammed and a car driving off while we are shown Bessie Love's anguished face watching from a window the departure which we do not see. This short scene in which the whole effect is concentrated on the actress's face, and which the silent cinema would have had to break up in several visual fragments, owes its excellence to the 'unity of place' achieved through sound. 2

In another example, René Clair describes how sound alone is used for meaning, not requiring an image. "In another scene we see Bessie Love long thoughtful and sad; we feel that she is on the verge of tears; but her face disappears in the shadow of a fade-out, and from the screen, now black, emerges a single sob."3 When sound is used "in" art, it interacts with other elements in a larger creative context. Sound extends space, time, and significance, going beyond the viewed image to places not visible. Arising from some cause, sound has a history and thereby can move the listener to the location and moment of its origination. Sound can be attached to, independent of, or in tension with images. Sound both clarifies and clouds meaning, depending on how it is used by the artist. Viewing and analyzing examples of sound in art can prepare the students for more meaningful creative explorations in their own work.

"Sound *as* art" emerged in the middle of the 20th century, when the artistic possibilities of sound broke out of the bounds of conventional music. Initially, sound technology was aimed primarily at capturing real-world, intentional sounds like talking, singing, and instrumental performances – and capturing them as faithfully as possible, "fidelity" being the desired quality. But the more the technology evolved, the more sound artists and engineers wanted to play and experiment. Electronic devices made it possible to filter, warp, reverberate, and otherwise alter sound as it was played. Magnetic tape became a new medium for recording, opening the possibility of cutting the tape and re-splicing it in all kinds of ingenious ways. This led to a new genre of called "electro-acoustic music."4 In France in 1949, Pierre Schaeffer coined the term "musique concrète," a genre in which all sounds, not just harmonies and notes, were considered to be legitimate building blocks of music. Around the same time, John Cage spoke of "found" sounds, the sounds that exist in our environment. Cage encouraged the listener to pay attention to what they thought was silence, where sounds happen apart from the listener's expectation and apart from a composer's control. In place of the term "music," Cage proposed the term "organized sound," finding raw material not only in mathematically-related frequencies and regular rhythms, but also in what we might previously have considered mere noise.5 The international Fluxus movement continued on this path, working with whatever sound material was available, putting the sound fragments together in a free-form and often minimalist style.6 This break away from conventional harmonic music and interest in technological manipulation of sound paved the way for today's hip hop, electronica, and digitally produced techno-music.

The legitimizing of sound as art was related to the Conceptual Art movement and a break away from conventional museum exhibits. Sound as art demands its own characteristic space because the environment itself is part of the creation. Art "installations" replaced museum exhibits. Art was experienced rather than viewed. N. B. Aldrich in his article "What Is Sound Art?" describes the experience of interacting with this kind of art.

The art installation…is an environment. It is a place where the audience is participating, or, rather, completing the art work through experiencing the environment. It is also the opportunity for an audience to engage work in their own time, the time they spend walking through the space, rather than be presented with a form that can be engaged only in its own time. The installation…invites the listener to create his or her own spatial relationship to the piece by moving through it and creating and individualized path or sequence.7

Considering both "sound *as* art" and "sound *in* art" requires

1 James Lastra, *Sound Technology and the American Cinema*. (New York: Columbia University Press, 2000).
2 René Clair, "The Art of Sound," in Elizabeth Weis and John Belton (eds.), *Film Sound: Theory and Practice* (New York: Columbia University Press, 1985), 92-96.
3 Ibid.
4 Herbert A. Deutsch, *Electroacoustic Music: The First Century* (Van Nuys, CA: Alfred Publishing Company, 1993).
5Leigh Landy, *Understanding the Art of Sound Organization* (Cambridge, MA: The MIT Press, 2007).
6 Hannah Higgins, *Fluxus Experience* (Berkeley, CA: University of California Press, 2002).
7 N. B. Aldrich, "What Is Sound?", http://emfinstitute.emf.org/articles/aldrich03/aldrich.html.(accessed March 3, 2009).

students to deepen their listening skills and sensitivity to sound. Sound has a strong affective component in its ability to trigger memories, images, and emotions. Thus, part of the conceptual introduction to sound can include listening exercises that sensitize students to the origins, reverberations, associations, ambiguities, and significance of sounds, including those sounds that we have grown to ignore.

As is always the case in teaching, there is more to cover than time to cover it, so choices must be made. It's possible to teach a course that is entirely historical and conceptual. On the other hand, the course could begin with concepts and historical perspective and continue with creative projects that reflect earlier discussions and analysis. The projects could challenge students to create "sound as art," or they could ask students to integrate sound in a multimedia piece. In any case, the conceptual background can motivate the students to more thoughtful work, moving the focus from technology to meaning.

What Tools Are Needed?

But let's get practical for the moment. What tools are needed for students to do hands-on work with sound? Getting ready to "do sound" – that is, getting the right computers, microphones, speakers, and software – may sound daunting at first, but it's relatively easy. If the emphasis in a course is on concepts, design, and art and not on professional-quality production, an inexpensive sound system is all that is needed.

Sound has benefitted greatly from the digital video revolution. Ten years ago, finding a computer adequately equipped for digital sound processing was much more difficult than it is today. Now most computers are shipped with a digital video application, and this implies that they also can handle sound. Many computers have built-in microphones and speakers, making a basic laptop or desktop computer sufficient for simple sound processing and experimentation. For less than $500 (as of the writing of this paper), a system can be upgraded with a better microphone, external sound interface, MIDI keyboard, and headphones, as shown in Table 1.

hardware	cost
dynamic microphone	$100
microphone XLR cable	$15
microphone stand	$15
external audio interface	$130
MIDI keyboard/controller	$130
headphones	$50

Table 1 Cost of upgrading your computer for audio

Digital audio software is also readily accessible and fairly inexpensive if the basic level suffices. Basic sound processing software is often bundled with a new computer. Garage Band, an easy-to-learn music creation program – comes with every Macintosh computer. The next step up for the Mac would be Logic Express, which currently can be purchased at an academic rate of about $100. Cakewalk Music Creator for Windows costs only about $40. Garage Band, Logic, and Music Creator allow for audio and MIDI track along with loop-based composition. Garage Band and Logic are supplemented with large sample and loop libraries. Free audio software is also available. For example, Audacity – an audio recording/editing program compatible with Windows, Mac, or Linux operating systems – can be downloaded free from the web. More powerful, specialized software (e.g., Adobe Audition, Logic Pro, Pro Tools, Cakewalk Sonar, or Reason) is more expensive (in the hundreds), but generally a 30-day trial version can be downloaded, and it may be possible to schedule the assignments to fit in that time window. Current digital audio/MIDI software is listed in Table 2.

Table 2 Current digital audio and MIDI software

With more sophisticated tools becoming available, the minimum knowledge and skill set required to do digital sound has shrunk. The software is user-friendly, hiding the technical details or offering choices of instruments and audio features in convenient user interfaces. Thus, incorporating sound into digital art courses doesn't require great technical expertise, nor does it rely on musical knowledge and ability. With the extensive loop libraries, even non-musicians

software	platform	availability	use
Audacity	Linux, Mac, Windows, Unix	free	Multi-track digital audio
Audition	Windows	commercial	Multi-track digital audio
Garage Band	Mac	ships with Mac	Multi-track digital audio and MIDI
Logic Express	Mac	commercial	Multi-track digital audio and MIDI

can experiment with musical composition. The emphasis can be on the creation of sound as creative expression, whether it is associated with visual objects or exists independent of visual reference.

The point is that the hardware and software needed for dealing with sound in digital art courses are readily available and not prohibitively expensive. Needs will vary depending on whether the course requires a fully-equipped lab or works under the assumption that students have their own computers. Needs will also vary according to the types of assignments made. Many simple but meaningful assignments can be done using just Audacity, which is free.

What Technical Knowledge Is Needed?

Because of digital art's technological underpinnings, digital art courses have to strike a balance between the technical, conceptual, and practical aspects of the subject. This continues to be true when sound is introduced. The amount of teaching time devoted to the technical and scientific aspects of sound depends, of course, on the goals of the course. Table 3 lists the fundamental concepts related to digital sound processing.

Table 3 Fundamental concepts of digital audio and MIDI

If an entire course is devoted to sound, then these topics can be covered in a systematic way. If sound is integrated into a digital art course along with imaging, then these topics can be covered on a need-to-know basis. For example, when students start a digital audio recording, they need to choose a sampling rate and bit depth for the file. To give a rationale for the choices, it's necessary to explain (1) how sound can be represented as a wave with multiple frequency components (2) how sound is digitized through a process of sampling and quantization (3) why sound has to be sampled at a rate that is at least twice the frequency of the highest frequency component (4) how a low bit depth leads to quantization error. Later, as the students learn to edit sound – for example, adjusting the difference between loud and soft portions of a piece – it may be necessary to introduce the concept of dynamic range and its relationship to bit depth.

Textbooks that link the science and art of digital media exist, including interactive online tutorials that the students can work through in their own time.[8] Requiring students to read and practice with this material can free classroom time for other discussions and activities.

Ideas for Assignments

The assignment ideas below were collected from this paper's authors and from participants in two workshops hosted by the authors in the summer of 2008.[9] The descriptions of the assignments have been abbreviated for this paper.

Contributed by Jason Romney, University of North

Project 1: Pick a children's book and create a sound design for each page of the book. Make a music track using loops and add sound effects for each page. Scan the pages of the book and put them in as PowerPoint slides and then add your sound tracks to each slide in PowerPoint. You can record someone speaking the words or let the audience read it to themselves. In either case, each slide can have an underscore sound and a single sound effect that can be triggered by clicking objects in the slide. This project allows the introduction of the time domain without requiring the student to learn animation.

Project 2: Tell a story entirely in sound and music but without words, approximately two to five minutes long. Use digital audio, creating your project in a multi-track editing environment. MIDI is optional. Apply special as appropriate effects to create your desired atmosphere and emotions. The sounds should provide a narrative structure. Play your piece without explaining the intent of your narrative, and have the listeners tell you what story they hear.

Contributed by Ken Baldauf, Florida State University

This assignment is intended to illustrate the difference, both intellectually and through object listening, between

8 Three companion books that link the science and art of digital media are Jennifer Burg, *The Science of Digital Media* (Upper Saddle River, NY: Prentice-Hall, 2009), Y. L. Wong, *Digital Media Primer* (Upper Saddle River, NY: Prentice-Hall, 2009), and Y.L. Wong, *Digital Media: Its Art and Science* (Upper Saddle River, NY: Prentice-Hall, 2009). See http://prenhall.com/digitalmedia/.

9See http://www.cs.wfu.edu/~burg/CPATH/WFU_Workshop/index.html and http://www.cs.wfu.edu/~burg/CCLI/Workshop1/ for workshop proceedings.

music that has been sampled at different rates using 8 vs. 16 bit samples values, mono vs. stereo samples, and compression vs. no compression. Begin by ripping one of your favorite songs from CD using the following format: wav, 16 bit, stereo, at 44.1 kHz or higher. Encode seven more copies of your song in the following formats: 8 bit mono, 6 kHz wav; 8 bit stereo 44.1 kHz wav; 16 bit mono 6 kHz wav; 16 bit stereo 6 kHz wav; 16 bit stereo 24 kH wav; 320 kb/s mp3, and 160 kb/s mp3. Without looking at file details, use what you've learned about digital sound to guess the file size and sound quality of each of these versions (ranking them from best to worst). Check the file sizes. Listen to each sound file and make notes on differences you perceive in the quality. Compare this to your expectations. (This could be done in any basic audio editing program that has the capability of changing sampling rate and bit depth.)

Contributed by Brian Evans, University of Alabama

This assignment introduces sound and sound design techniques of musique concrète (which we'll call "sound collage" in this assignment). This assignment will require that you think about time-based media and explore temporal structure. Create a stereo sound file composed of at least three different sound sources (and not too many more). The finished file should last exactly 90 seconds. Also hand in (1) a score (graphical and notated) that outlines the composition of the file. (See *Notations* by John Cage and other examples to be cited by the instructor.) Incorporate signal processing techniques such as EQ and pitch shifting. Explore at least three standard "classical tape techniques." Give the file a coherent formal structure. Use multi-track recording. (This could be done using SoundTrack, Audacity, and/or Garage Band. Signal processing packages like TimeToy could also be used.)

Contributed by Joe Pino, Carnegie-Mellon University

The object of this assignment is to explore sound textures and manipulate timbres. Using the sound source files provided, you are to edit, mix, and manipulate as many different sounds as you can produce in three hours. Then, using these files, sequence the sounds into a three minute soundscape that tells a story in the sense that there is a change from one mood to another or some sequence of "cause and effect." You can use functions to change pitch, duration, or gain; convolve; modulate; reverse; fade in/out; convert sample rate; or phase vocode. Experiment with ways of combining the original sound with one or more of the additional sounds to create new sounds that complement the original mental image, augment it, or alter it to something new. Focus on creating sounds with complex and interesting texture and color. Don't be concerned about *what* a sound is; only *how* it is. Do not spend more than five hours on this project, three to create the source material and two to mix a final soundscore. (This could be done with basic audio editing software.)

Contributed by Conrad Gleber, La Salle University

Select a poem with at least 100 words. Select 20 to 30 words in the poem that are descriptive of action (windy, splash, cracking, crunch, etc.). List the words and give each of the selected words a sound (no music allowed). The result is a group of sounds that are placed into an audio track. Associate each sound with a picture on the video track. Now design and manipulate the audio and pictures to create a combination of images and sound that is a more cohesive, albeit abstract, work. (This could be done in Director, Flash, Final Cut, or Premiere.)

Contributed by Roy Carter, Wake Forest University

Week 1 (Design) Choose an experience (based on a real or imagined interaction) that produces a change in mood, idea, attitude, or physical orientation. This experience will serve as the inspiration for a collection of images, sounds, motions, and interaction techniques that you will create with authoring software. Create a lo-fidelity prototype for the experience. Allow for experimental user interaction that is intended to expand the user's understanding of the moment. Decide the elements that you will have control over and those that the user can control. Week 2 (Building Components) Experiment by building a palette of sounds and imagery. Limit our selections by evaluating the potential of each for communication. The sounds may not be representative of objects within your images, and the images may not be directly representative of objects within the experience. Open your mind to the abstractions. Your focus experience may be the moments surrounding the situation that you are referencing and not the situation itself. Layer the sound in the experience for richness. Week 3 (Laying Out the Design) Lay it all out in your authoring environment. Be sensitive to relationships that are naturally happening in your imagery and audio. Don't be heavy-handed with your message. Let it develop out of your process. (This could be done in Director, Flash, Final Cut, or Premiere.)

Contributed by Jennifer Burg, Wake Forest University

This type of project could be done with any number of stories, but we'll use William Faulkner's "A Rose for Emily" as an example. This story tells of Emily Grierson, a proud Southern woman at the turn of the century who sees her best years pass her by as she ages into a lonely reclusive spinster. When Emily dies, it is discovered that she has kept a corpse locked in her bedroom and lying upon her bed, probably the Yankee construction worker who jilted her years ago. Read the story and discuss it with the class, including the story's treatment of time and Emily's desire for things not to change. Create one digital image to illustrate this story and express the theme that you think is central to it. To go along with this picture, create an audio piece that also illustrates this theme. As you create the audio piece, consider how sound can be used to extend the boundaries of a picture in both space and time. For example, if the picture is of the inside of Emily's house, consider what is going on outside. You can use both recognizable and unrecognizable sounds, since the fact that a sound is not recognizable might also convey meaning. Use digital audio, creating your project in a multi-track editing environment. MIDI is optional. Create all your sound from original recordings or from the library of public domain sound effects made available to you. Do not take sounds from web sources. You can put our final production in PowerPoint. The PowerPoint presentation should begin with a title page, and the sound should be set to play automatically when the user goes to the image after the title page. (This could be done with basic audio editing and MIDI software such as Cakewalk Music Creator coupled with PowerPoint.)

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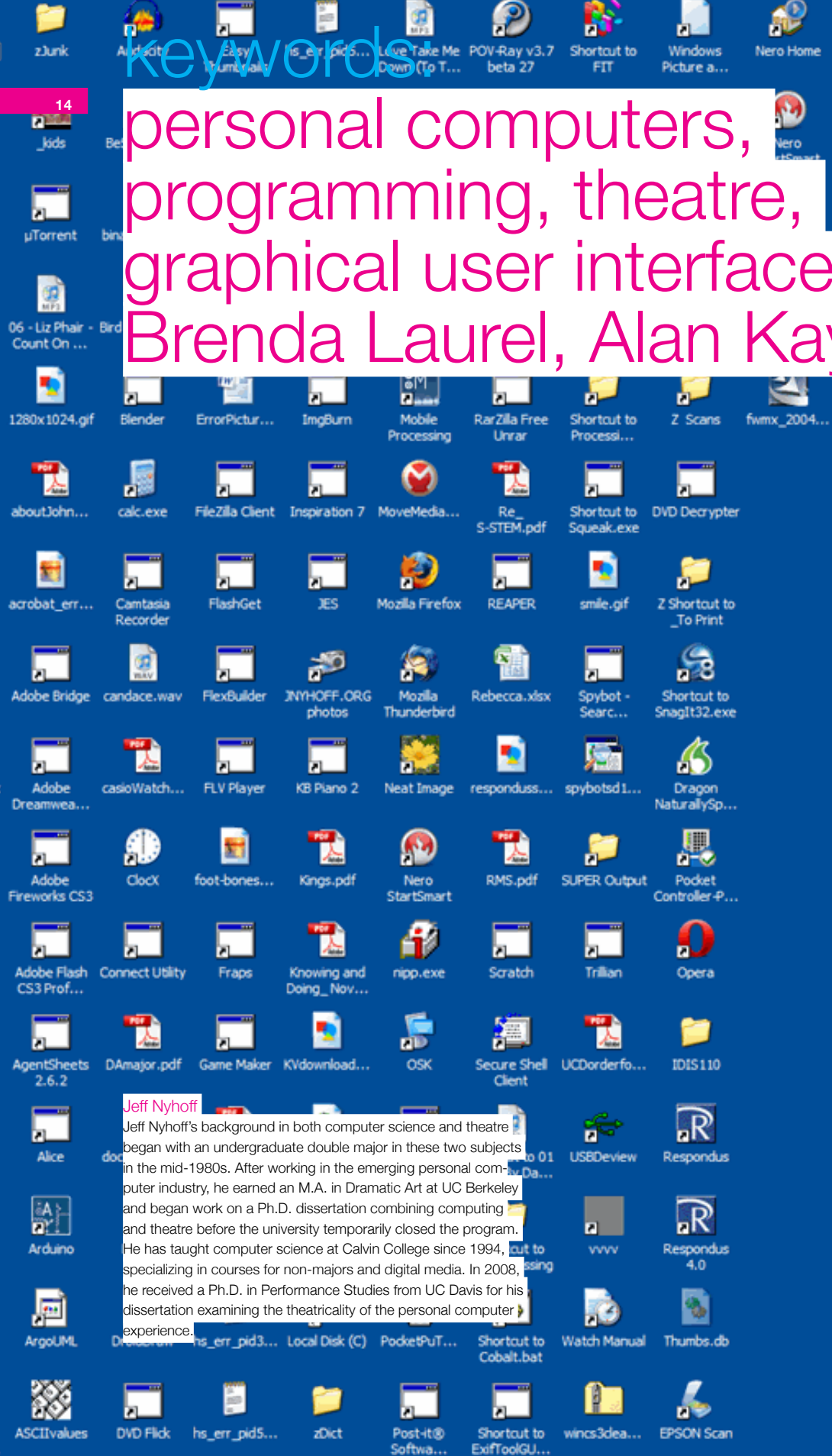
keywords:

personal computers, programming, theatre, graphical user interfaces, Brenda Laurel, Alan Kay



Jeff Nyhoff

Jeff Nyhoff's background in both computer science and theatre began with an undergraduate double major in these two subjects in the mid-1980s. After working in the emerging personal computer industry, he earned an M.A. in Dramatic Art at UC Berkeley and began work on a Ph.D. dissertation combining computing and theatre before the university temporarily closed the program. He has taught computer science at Calvin College since 1994, specializing in courses for non-majors and digital media. In 2008, he received a Ph.D. in Performance Studies from UC Davis for his dissertation examining the theatricality of the personal computer experience.

Performing the Interface

Jeffrey L. Nyhoff, Ph.D.
Calvin College

Abstract

Brenda Laurel in Computers as Theatre (1991) contended that the personal computing industry that emerged in the 1980s had heuristically installed a graphical user interface (GUI) that was actually a form of theatrical experience. Similarly, Alan Kay has claimed that the GUI system developed in the 1970s at Xerox PARC was conceived in explicitly theatrical terms, yet also insisted that this GUI paradigm was ruinously adapted by Apple and Microsoft for the Macintosh and Windows GUIs they introduced in the mid-1980s, the same commercial GUI systems whose theatricality Laurel celebrated. This article seeks to clarify this apparent contradiction.

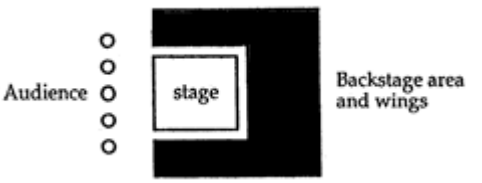
Reflecting upon the rise to dominance of the commercial graphical user interface over the course of the latter half of the 1980s following the introductions of the Apple Macintosh and Microsoft Windows operating systems in 1984 and 1985, Brenda Laurel argued in her 1991 book, *Computers as Theatre*, that this new interface paradigm should be celebrated, theorized, and designed in terms of its creation of a distinctively *theatrical* experience for the user. Laurel warned that the "causality" of this ancient and primal cultural form of theatricality is so forceful that, once GUI designers began making use of it, their resultant interfaces now "try to be and do" theater, "whether you want it to or not."[1] For this reason, Laurel turns to Aristotle's treatise on Greek tragedy that has dominated Western theater theory and practice for well over two millennia, the *Poetics*, repurposing Aristotelian theatrical principles and applying them to the GUI experience, both descriptively and prescriptively: "Confusion over the nature of human-computer activity can be alleviated by thinking about it in terms of theater, where the special relationship between representation and reality is already comfortably established, not only in theoretical terms but also in the way that people design and experience theatrical works."[2]

Laurel laments that so many GUI designers have focused upon the representation of onscreen *objects*. In contrast, an Aristotelian theatrical approach to GUI design, says Laurel, demands a focus on the careful design of representations of *action*. In the *Poetics*, even the notion of *character* is conceived entirely in terms of the individual actions that an individual chooses to perform within the given circumstances of the play's overall action.

Believable Illusions

Laurel repeatedly invokes Aristotle's definition of theater as the "representation of action" in her text and carefully examines this notion of dramatic "action," but she performs far less analysis of the other key term in this definition: "representation." What soon becomes apparent is that the GUI theatricality Laurel celebrates is heavily influenced by the aesthetics of theatrical "realism," where effective representation is equated primarily with visual *believability*. Laurel seems to forget that "realistic" theatrical representations are not natural or universal but are conventionalized and culturally specific and that, likewise, the commercial GUI paradigm visualizes user actions in terms of well-established conventions for representing onscreen action.

Laurel's conception of GUI theatricality is also, like realist theater, predicated upon tight constraint of what the audience *sees* and *knows*. Her illustrations of realist "proscenium" theater structures indicate a notion of theatrical space that has a clearly and firmly delineated "backstage" area.There should be nothing visible that calls the audience's attention to the "technical 'magic' that supports



the performance," says Laurel, because "who, what, and where" this technical magic has been created and is operating should "*not matter* to the audience."[3] In time, audiences will learn to expect – and to *accept* – such invisibility, finding that the less they see and know about such technical operations *backstage*, the more readily they are able to commit to belief in the representations of action *onstage*. Laurel cites Coleridge's "willing suspension of disbelief," whereby audiences learn from prior theatrical experiences that they are expected to commit to belief in what might initially seem to be unrealistic representations in exchange for a pleasurable theatrical experience. Thus, theatrical immersion depends upon not only visual but also *cognitive* constraint of the audience, who should use neither seeing nor thinking about the backstage technical operations. When a theatrical representation of action is "working," Laurel says, audience members should become so thoroughly "engaged by and involved in the play" that they are "simply not aware" of anything other than the visible "action on the stage."[4]

Such theatrical immersion turns largely upon *emotional* mechanisms, particularly through the cultivation of such strong *identification* with the actions and circumstances of a character that one's reflex emotional response to them is as if they were one's own. This is key to Laurel's remarkable claim that the GUI user occupies the theatrical position of not only *audience* but also *actor.* She seems to have in mind popular notions of "method acting" when she insists that, "for the actor on stage," the ideal "experience is simi-

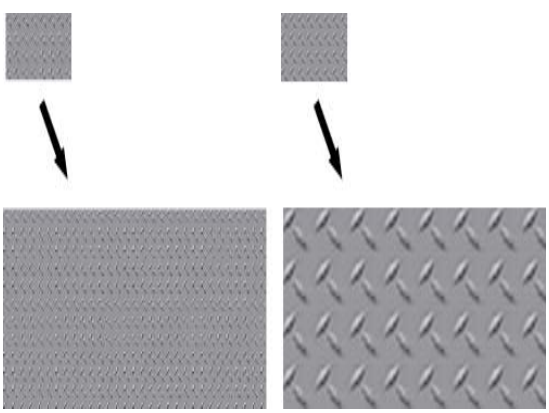
1 Brenda Laurel, *Computers as Theatre*. (Addison-Wesley Professional, 1993), 41.
2 Ibid., 32.
3 Ibid., 15.
4 Ibid., 15-16.

lar" to that of the immersed audience, in that "everything extraneous to the ongoing action is tuned out" in favor of visual and emotional identification with character action: "for actor and audience alike, the ultimate 'reality' is what is happening in the imaginary world on the stage – the representation."[5]

Laurel also calls attention to the distinctly disembodied and preeminently engrossing notion of *screen*-based forms of such theatricality. For the immersed theater audience, "plays are like movies: when you are engrossed in one, you forget about the projector, and you may even lose awareness of your own body."[6]

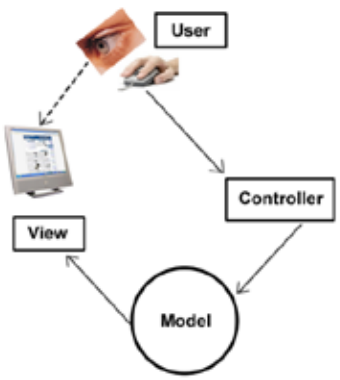
I contend that the transfer of these paradigms of disembodied and engrossing screen-based theatrical action from the film and television screen to the computer screen made it possible for the notions of actor and audience immersion associated with such popular forms of theatricality to become one in the mind of the GUI user. Thus, while no user has ever occupied a position of both actor and audience in an actual theater, countless first-time users of the commercial GUI paradigm introduced with the Macintosh in 1984 found such a double theatrical experience to be a familiar and highly intuitive one.

The GUI's theatricality is such that users *believe* that they are able to watch themselves directly manipulate onscreen entities – for example, in resizing an onscreen rectangle:



However, this GUI theatrical experience is founded upon a total and enduring belief in what interface theorist Ben Shneiderman celebrated as the GUI's "illusion of direct manipulation."[7]

This can perhaps be best illustrated and described by a diagram of the GUI design scheme known as "Model-View-Controller (MVC)." GUI users believe that they are interacting directly with the "View" displayed for them on the screen. However, this software-constructed View is merely one of what might be many visual representations of



the software "objects" that have been encoded in the single software "Model" that drives program. A separate "Controller" software unit acts upon any user inputs that have been defined in the Model as meriting a response – e.g., clicking and dragging a corner of the rectangle – and ignores all others. Whenever such an interaction via the Controller software results in a change in the state of the Model – e.g., a change in the stored size of a particular "rectangle" software object – the Model might generate an update in the View – e.g., an alteration of the size of the onscreen visual representation of the rectangle.

Thus, while GUI users experience themselves to be directly manipulating objects on the screen, users occupy no such direct causal relationship to the screen. Rather, the unseen software Model determines any onscreen representations and onscreen actions. The illusion of direct manipulation creates a believable user experience of hand-eye coordination, but, in fact, the unseen Model is always already operant "between" the user's hand movements of the input device and the onscreen actions subsequently observed by the user's eye. Well-engrained Aristotelian theatrical sensibilities that have trained GUI users to keep their focus confined to the screen have also disposed them to the belief

5 Ibid., 14-16.
6 Ibid., 15-16.

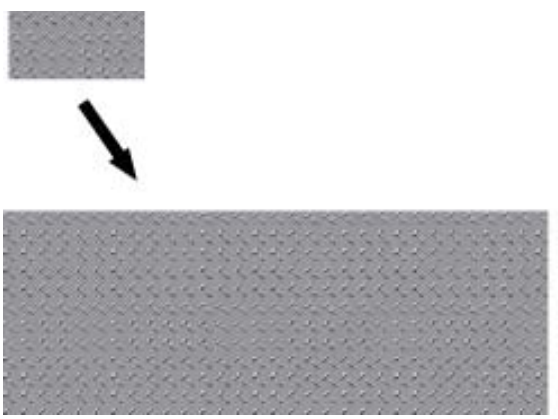
7 Ben Shneiderman, "Direct manipulation: a step beyond programming languages," IEEE Computer August (1983) 57–69.

that they are protectively "screened off" from the sort of dreaded backstage technical operations that users associate with non-GUI computing, but, in reality, these technologies operate neither "backstage" nor "behind the screen" but, rather, *between* the user and the screen.

Users know that the onscreen objects are not real. However, they are strongly inclined to believe that the illusory directness of their manipulations of the screen *is* real. Thus, the theatricality of the GUI user's experience of onscreen performance produces not merely a "suspension of disbelief" but outright *belief* in an illusion – a belief that *endures*, even outside of the GUI performance context.

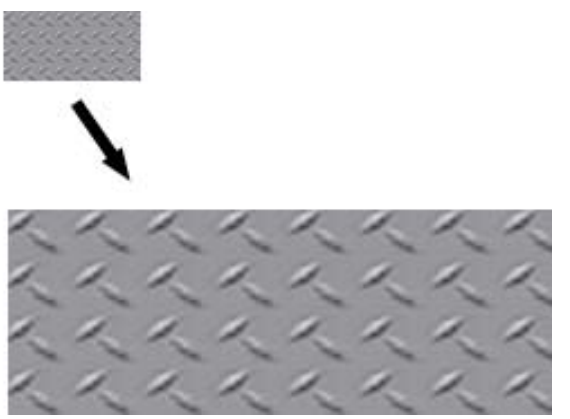
Constraints

Laurel insists that the GUI's Aristotelian theatricality should be designed with sufficient "constraints" to discourage the user from even *thinking* about whether there are unseen software systems at work "backstage." However, because users are often displeased by "explicit constraints" that prevent them from performing a certain action in a given context, GUIs should be designed instead with implicit constraints on what users are even "likely to think of doing," because such constraints can be "applied without shrinking our perceived range of freedom."[8]



Laurel's rationale for such user constraint proceeds from her Aristotelian notions of theatrical character and action, where characters in a play have neither a free range of action nor a free range of *thought* about their choices of action but, rather, perform the actions that they have been designed to *choose* to perform within the given circumstances, in service of the play's overall action scripted by the playwright. However, this particular theatrical analogy also casts light on the fact that users *always* perform within a scripted and constrained range of actions, and they perform as themselves only within the confines of a scripted and constrained *character*. But this "user model" is presented to us in such a way that our Aristotelian theatrical reflexes predispose us toward uncritical identification with this persona and the limited set of choices of action for the given circumstances.

Indeed, I suggest that the introduction of the Macintosh via Apple's famous television commercial in 1984 inaugurated not only a new era of GUI-driven personal computing but also played upon a familiar "screenic theatricality" that predisposed consumers not only toward an acceptance of the commercial GUI's theatrical experience as "intuitive" but also toward an identification with a new "class" of computer user: namely, the "end user," the non-programmer. Such end users have continued to be depicted as being spared from what had been for previous generations of "users" the arduous task of writing their own software; however, the more subtle and deeply problematic reality is that end users were also locked out of access to software models that, in turn, shape the *mental* models of their own attributes, actions, and onscreen persona – not only in computer games but also in the "real life" work we do on computers.



Such highly constrained end user experiences are not always theatrically pleasurable. Consider, for example, an end user who observes two visually identical rectangles on the screen of an "application" software program such as Microsoft Word or PowerPoint.

8 Ibid., 105.

The user knows from prior experience with the conventions of the commercial GUI's theatricality that an onscreen image can be resized simply by clicking and dragging one of the "handles" displayed on its perimeter. However, on this occasion, when the user performs exactly the *same* resizing operation on two visually *identical* rectangles, there are two drastically *different* visual results:

n Kay had worked to develop Kay's vision of the "Dynabook," "a portable interactive personal computer, that would be accessible as a book."[9] The Dynabook's Smalltalk software included a graphical user interface designed to be so intuitive that even a child would be able to begin to learn to use this computer system, by means of intuitive graphical representations of objects, rather than having to master a cryptic syntax of alphanumeric commands.

A version of Smalltalk featuring a "desktop" GUI had also been deployed in the "Alto," a computer designed at PARC for office employees with little or no computer experience. This was done in an attempt to demonstrate the feasibility and marketability of such technologies to Xerox executives – who were not convinced and soon canceled the Alto and Dynabook projects.

In 1979, Apple co-founder Steve Jobs visited PARC where he saw a demo of the version of the Smalltalk software used in the canceled Alto project, and he recalls that "within … ten minutes it was obvious to me that all computers would work like this some day."[10] Inspired by what he had seen at PARC, Jobs was determined to develop an Apple microcomputer system featuring precisely this kind of graphical user interface, and, in 1984, the "Macintosh" was famously introduced, followed a year later by Microsoft's "Windows." The GUIs of both of these systems bore many similarities to PARC's Smalltalk interface.

It is tempting to regard Kay's vision of Smalltalk and the Dynabook as having been realized in the GUI-driven notebook computers and PDAs that have become ubiquitous in the present decade. However, Kay continues to insist that the Dynabook "revolution hasn't happened yet," criticizing the commercial GUI paradigm that has emerged, declaring that "both Apple and Microsoft did a terrible job adapting the PARC interface."[11]

Given Brenda Laurel's compelling arguments in 1991 in *Computers as Theater* regarding the inherent theatricality of the same commercial GUI paradigm that Kay condemns, I was quite surprised to hear Kay insist during a 2001 keynote address that the design of PARC's Smalltalk had been informed primarily by a *theatrical* conception of the user experience, a fact Kay attributed largely to his heavy involvement in theater while he was an undergraduate when he "was supposed to be studying math."[12]

Unfortunately, Kay's remarks regarding this fundamental theatricality of Smalltalk turn out to be surprisingly few and aphoristic. However, I have come to believe to be the most crucial aspect of both Kay's undergraduate theatrical experiences and the theatricality he envisioned for the Smalltalk user is that both are experiences of substantive theatrical *participation*.

It is crucial to remember that, unlike the Macintosh and Windows operating systems, Smalltalk was not merely an operating system featuring a graphical user interface, but was also a *programming* environment: in fact, the Smalltalk GUI, the Smalltalk operating system, and the Smalltalk application software programs were all written in the Smalltalk programming language. Moreover, one of the primary goals in developing Smalltalk for the Dynabook was to provide a more graphical and intuitive form of software programming.

Learning Curves

Kay had insisted that working with computer images provided one of the best examples of the kind of "learning curve" that he hoped Smalltalk could facilitate. A child working in Smalltalk will soon "learn that a picture has several representations, of which only the most obvious – the image – appears on the screen." As the child begins to explore these other representations of the object, the child comes to realize that "the most important representation" is the "model," which not only can be investigated through the various views but also is "editable."[13]

9 Alan Kay and Adele Goldberg. "Personal Dynamic Media." *Computer*, 10 (1977): 31-41.
10 "Triumph of the Nerds: The Transcripts, Part III." http://www.pbs.org/nerds/part3.html (Accessed March 11, 2009).
11 Alan Kay. "The Computer Revolution Hasn't Happened Yet." Keynote address at the Digital Cultures Project, UCSB, Santa Barbara, California, March 8, 2002.
12 Ibid.
13 Alan Kay. "Microelectronics and the Personal Computer." *Scientific American*, September, 1977, 236.

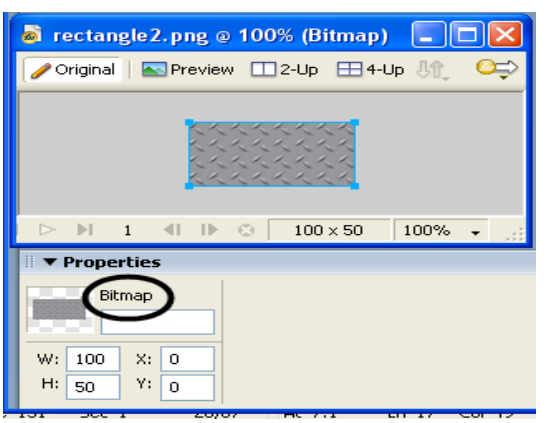
During Smalltalk's development, Kay's team regularly introduced Smalltalk to children who had never used computers. After exploring the given Smalltalk objects and applications, these children would often soon decide that they would like to customize one of the given objects – e.g., to use the existing "brush" tool in the Smalltalk "paint" application to create a new, customized brush tool object that offered different characteristics. In time, a Smalltalk user would then go on to examine the object's actual Smalltalk programming language code, which was much simpler syntactically than that of previous programming languages. Moreover, because of Smalltalk's object-orientation, there was a clear correspondence to the graphical representations of the object, whereby elements of the Smalltalk code in the software model of this object could seem surprisingly familiar to the user, even at first glance.

Thus, Smalltalk had been designed to facilitate the user's journey along a learning curve that could lead to increasing degrees and additional forms of participation in the theatrical performance being staged – not unlike Kay's experience of becoming increasingly involved in theater while an undergraduate. The Smalltalk user was not to remain a mere spectator, nor merely an onscreen performer with no awareness of what had been scripted, designed, or was operating "backstage." Rather, Smalltalk was designed to help and to encourage the user to participate as designer and author of the theatrical experience as well, learning and acquiring new capacities for participation in doing so.

The Smalltalk programming language's robust and powerful object-orientation aroused much interest and enthusiasm among expert software programmers, to such a degree that, as Xerox corporate support for Kay's team's Dynabook project waned, Smalltalk was gradually developed by others into a more powerful but also considerably more complex, programming language, one designed primarily for experienced programmers rather than for novices. However, in the late 1990s, Kay and other members of his PARC team were able to acquire the rights needed to resume development of one of the last of the novice-oriented versions of Smalltalk they had developed at PARC, resulting in the creation of "Squeak," which Kay has called "a 21st-century version of the [Smalltalk] system we did at Xerox PARC," where the goal once again was that or providing the user an intuitive, graphical, and object-oriented software *authoring* environment.[14]

Even so, I believe that an important aspect of the Smalltalk legacy has been largely overlooked: namely, that much higher-end image editing and illustration software, particularly those that work with vector image objects, can also be said to have preserved precisely the kind of "learning curve" experience that Kay had envisioned and had observed in action when novice users began to interact with image objects in Smalltalk.

For example, in contrast to the alienating and disturbing end user experience of the "two rectangles" staged by typical commercial application software, software such as Adobe (formerly Macromedia) Fireworks stages a very different experience for the user. Like Smalltalk, Fireworks offers *multiple* representations of image objects. This creates the sort of theatrical experience that Bertolt Brecht called "complex seeing," which challenges user expectations of over-simplified concepts and illusionistic aesthetics and provides instead the opportunity for what Brecht calls a more "scientific" form of theatrical engagement, leading not to mindless pleasure but to the pleasure of *learning*.



In addition to the two nearly identical graphical views of these two rectangles, the Fireworks user would see two

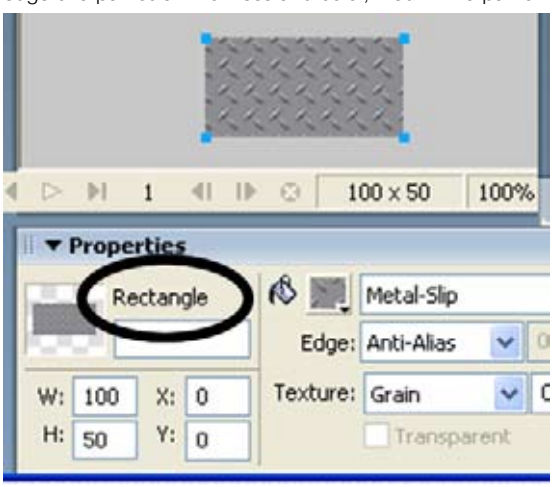
14 Kay, "The Computer Revolution Hasn't Happened Yet."

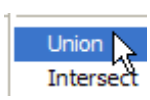
very different representations of each rectangle in the *Properties* panel. There, one image is identified as a "bitmap" image:

Because the software model of a bitmap image is defined merely as a matrix of pixels, a kind of "spreadsheet" of color numbers that comprises a "recipe" for this image, the key attributes are limited largely to its pixel dimensions, as evidenced in the Properties panel.

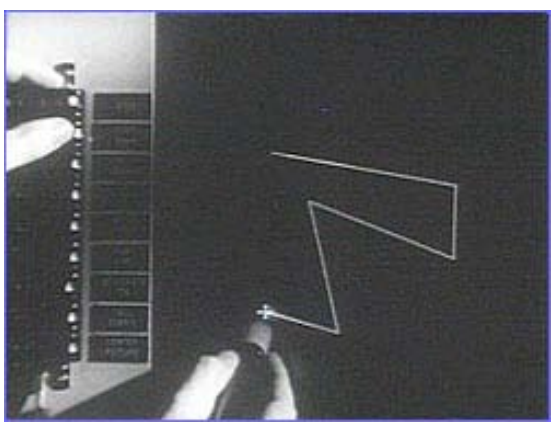
In contrast, the other image is identified as a "rectangle" object:

Here, the software model is the geometric one of a *vector* image object – in this case, a rectangle that not only has a certain width and height, but also is defined to have an edge of a particular thickness and color, filled with a particular color or pattern, and so on. Not only does this greater number of attributes offer more opportunities for manipulation, but a vector model also enables the performance of a variety of geometric operations, such as unions and intersections with other vector image objects:





Thus, the Fireworks user is given not only a graphical *view* but also, in the Properties panel, a clear representation of the *model* of this object – what in object-oriented programming (OOP) terms would be called the general *class* of this image object and the current states of the key attributes for this particular *instance* of this class. The attributes shown in the Properties panel correspond so isomorphically to the software model of this vector object that they facilitate user understanding of the categorical difference in class between these two visually identical rectangles, explaining why they behaved so differently when they were resized.And while some might insist that this is still a far cry from what would usually be considered to object-oriented *programming*, I content that such richly object-oriented graphical computing undertaken in software like Fireworks is an indeed graphical – but, nonetheless, *true* – form of object-oriented *programming* and is an important remnant of the PARC Dynabook Smalltalk vision. Alan Kay, in fact, has often insisted that Ivan Sutherland's 1963 "Sketchpad" system deserves to be considered to be the first object-oriented programming environment because this entirely graphical system of object design had made use of "master" objects that functioned much like "classes" do in OOP



This is, of course, also the way "symbols" and vector objects function in Fireworks as well as in Flash.

Thus, it is no accident that such graphical notions of object-oriented programming seem to have been preserved in such digital media software; these were the primary modes in which such visionaries as Sutherland and Kay conceived and implemented these ideas and technologies in the first place. Therefore, I suggest that such object-oriented software experiences offer a uniquely valuable learning curve opportunity for end users to break out of the constraints upon their range of knowledge and action by the commercial GUI paradigm that has dominated computing for the last quarter-century. Indeed, this pedagogically multi-modal graphical, alphanumeric, and kinesthetic learning curve is one that often leads to surprising forms of object-oriented programming. I continue to be astonished by the growing number of digital media

artists in recent years whose creative drive has led them to undertake the learning of software programming. The sheer syntactical difficulty of such "standard" programming languages such as Java and C++ still pose a lamentably steep learning curve. However, it is becoming increasingly common for artistic users to move from creating animations in Adobe (formerly Macromedia) "Flash" strictly via the GUI to "coding" animating instructions in "ActionScript," Flash's JavaScript-like programming language.[15] In such "scripting" languages, "friendlier" than most full-fledged programming languages, resizing a given onscreen rectangle object to a size of 400 x 200 pixels might be done via code as simple as:

```
rect.width = 400;
rect.height = 200;
```

Likewise, the work of Casey Reas and Ben Fry this decade in developing the Java-based "Processing" programming language for graphical artists also points toward remarkable possibilities inherent in a return to a more graphical, artistic, and theatrical conception of object-oriented programming language design, pedagogy.[16]

15 Flash's ActionScript has recently become fully object-oriented as of version 3.0.

16 "Processing is an open source programming language and environment for people who want to program images, animation, and interactions. It is used by students, artists, designers, researchers, and hobbyists for learning, prototyping, and production. It is created to teach fundamentals of computer programming within a visual context and to serve as a software sketchbook and professional production tool." *Processing 1.0*. http://www.processing.org (Accessed March 11, 2009)

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Keywords:
Remix, remixing, mix, mixing, audio, video, mash up, media, new media, digital media, media ecology, art, contemporary art, McLuhan, Postman, Deleuze, Guattari, DJ, VJ, digital art, aesthetics, identity, image, avatar, screen name, YouTube, MySpace, Facebook, digital sociology

Jamie O'Neil

Jamie O'Neil is a video/multimedia designer and performance artist. His research interests include remixing, digital culture, postmodern design, tactical media and relational (or dialogical) art and aesthetics. O'Neil is the creator of the mock-motivational speaker Kurt Weibers, who appears in O'Neil's video essay on the topic of remixing entitled: "The Medium is the Mix," which can be found at www.McLuhanRemix.com. He is Assistant Professor of Digital Media Arts at Canisius College in Buffalo, NY.

Remix Identity: Cultural Mash-Ups and Aesthetic Violence in Digital Media

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Abstract
This paper interprets the superabundance of video mash-ups (the remixed/repurposed media creations that have made YouTube iconic) as a generational, aesthetic response to identity crisis. Today social

networks (MySpace, Facebook, etc.) play a crucial role in identity construction, and factored together with YouTube, are an important channel of discourse in the spastic environment of terrorism and war that surround the present generation of digital natives.

Figure 1 Detail of L.H.O.O.Q by Marcel Duchamp (1919)1

> When one has been hurt by new technology, when the private person or corporate body finds its entire identity endangered by physical or psychic change, it lashes back in a fury of self-defense.
>
> — Marshall McLuhan, 1968[2]

The term "mash-up" sounds brutal. In one sense, remixing can be thought of as a form of "lashing back" at mass media. Forty years ago, McLuhan theorized that violence is a quest for identity, spurred on by the destruction of private-literary-individual-psychic space – by (what we now call) digital media. Although networked, digital identity construction has the possibility of increasing the range and quality of expressivity; it also undermines the traditional, authentic feeling of individual identity and cultural belonging. On the social level, this results in a confusion of cultural identity, which McLuhan saw in the rise of tribalism (today's fundamentalism) and the struggle to hold onto patriotic identities of old. This paper builds upon McLuhan's contention that digitization (the conversion of analog messages to discrete 1's and 0's) causes identity crisis which, in turn, leads to the present state of polarization, extremism and ultimately conflict between old identities and new.

Jean Baudrillard, referring to McLuhan, said that the worst type of violence is aesthetic violence.[3] He suggests that when message is lost in massage, and our lives become Reality TV through self-broadcasting, social networking etc.; when old forms of cultural richness, differentiation and depth are transformed into info-entertainment via the screen; the digital native finds only meaninglessness. Remix identity – the process of superimposing multiple identities, either in cultural works (songs, videos or visuals) or through virtual personal identities (avatars, aliases, online identities) – is a way of dealing with this mixed-up cultural situation; it allows for a heterogeneous conglomeration, where the original is "layered" with new potentialities. Although mashing-up is a violent act against the transcendent "original," it is a better option than the artificiality of mass media or state-funded preservationist cultural projects, and is also perhaps, a better way of being rebellious for today's generation of digital natives.

MySpace, MySelf

With a remix, there is a striking reversal of content and form. Consider how a web designer chooses an appropriate formal design to express the content of the site; the Remixer begins with just the opposite: a final form first, as a finished song or video is usually the main content. One could argue that the same could be said about any piece of digital media art that "samples" material (e.g. a website that employs a stock photo), except for one special characteristic that makes the remix unique: it maintains the *identity* of its source content. Whereas a sampled piece of audio can easily become obscured in a song by Nine Inch Nails, (because it has been synthesized into a new rhythm), a remix is always transparent to its original content. This issue was at the core of the dispute over Vanilla Ice's famed sampling of the Queen/Bowie single *Under Pressure*. In my view this was a debate about identity. Vanilla Ice claimed his song was different because of the addition of one note, but the inherent identity of *Under Pressure* was unmistakable, thus his song was a remix even if that was not his intention. Alternatively, an intended remix is overt in revealing the identity of the original content; it transforms

1 Image retrieved from http://en.wikipedia.org/wiki/Mona_Lisa (accessed 15, 10 2008).

2 Marshall McLuhan and Quentin Fiore, *War and Peace in the Global Village* (New York: Simon & Shuster Inc. 1968. 1985) 97.

3 "Jean Baudrillard - Cultural Identity and Politics - 2002 3/8" *http://www.youtube.com/watch?v=AZmKCzRR5vU (accessed October 15, 2008)*

the "original" like a demi-mask when layered over a familiar face.

Remix extends far beyond the realms of music and digitally sampled images and can be globally defined as any appropriation of preexisting content that maintains that content's identity. Hybrid meta-media such as MySpace, Facebook, and YouTube are markedly different than "cool" media in determining identity formation. Digital natives differ from past groups, by virtue of being an Internet generation as opposed to one shaped by the forces of rock-n-roll or TV. The effect of *Elvis*, *The Beatles*, or even *Sesame Street*, on their respective generations hinged on regarding these cultural icons as "originators" of content. Conversely, MySpace, Facebook, and YouTube are empty vessels, where many different kinds of content converge. For instance, *Crank Dat Soulja Boy* remixed with *Spongebob* receives over 50 million views.[4] This is an important clue in relating to this remix generation, who, like their continually evolving playlists, are more adaptable (or susceptible) to continual identity mutations.

Before expanding upon this thesis, a short clarification on how I am using the term "identity" is useful. Identity is a term that originated in ancient philosophy for the purpose of describing an inanimate object's inherent being. Empiricists are credited with the modern colloquial understanding of human identity, as something equated with the psychological Self.[5] There is also corporate identity, cultural identity, and racial/gender identity, all of which refer to the organizational identity of groups. Because my theory intends to be scale-independent, I will be referring to both social and individual modes when using the term "identity" in this paper. Furthermore, it is important to clarify the difference between the terms "identity" and "image." An individual, group or inanimate object will project an "image," whereas "identity" concerns an authentic understanding. For example, we may attempt to alter our personal image with a makeover, but our self-identity may not accept our new image as "who we really are." Thus identity points to a more profound or absolute sense of selfhood or group membership.

The Remixer: Consumer/Creator

> "It used to be that assuming or redefining an identity took a lifetime. Now it can be done in as long as it takes to shop for an image."
>
> - Brian Massumi[6]

Figure 2 web advertisement for HP (2004)

A few years ago an advertisement declared: "You Are Your Playlist." There is a validation of this idea through serious consideration of remix identity. Though it may sound shallow, empirically, our self-identity begins with what we consume, through our education, environment, and the screens and earplugs that feed us. Remix culture is forever engaged with consumer culture in a struggle over representation rights for the official picture of reality. Culture is the identity of a society, and "playlist" is the interface between individual and social interpretations of the world. A new form of alienation occurs when people over-internalize their playlists like embedded product placement ads. When culture proper takes on exchange value and aesthetics are available to anyone willing to pay, identity becomes too fluid, like capital itself. Traditional Marxist alienation becomes a deeper, more introverted disjunction between

4 "Crank Dat Soulja Boy Spongebob" *http://www.youtube.com/watch?v=v3ARyAb_1Bs* (accessed August 12, 2008).

5 Robert Langbum, *Mysteries of Identity*, (London: University of Oxford Press, 1977) 25.

6 Brian Massumi, *A user's guide to Capitalism and Schizophrenia: Deviations from Deleuze and Guattari*. (Cambridge, Massachusetts: The MIT Press, 1992) 134.

authentic feelings and the fragments of identity.[7] The division between consumer and creator breaks down, and near the threshold, the activity of shopping itself equates to cultural production. Then art lashes back. Perhaps energized by the old transcendental motives, but regardless of why, a "quarrel over representation that sets art and the official image of reality against each other"[8] ensues. Critics of remix must come to see it as the way we insert our subjectivity into media playlists that have been over consumed – mashing-up is media regurgitation.

Figure 3 Image from Apple™ advertisement (late 1990's)[9]

A discussion of art digesting consumer society cannot avoid mention of Apple Computerä. In fact they sell "genius" through a process quite similar to beat-syncing (the mixing of a pre-existing song with other musical elements). In the same fashion, Apple's appropriation of past icons was a way of remixing genius identity with Apple's logo superimposed over it like a groove locked into the same tempo. Ironically, John Lennon can be used to sell their computers, but don't try to remix a *Beatles* song on your Mac as its software blocks remixing of its own songs (GarageBand cannot import a song purchased from iTunes). Apple's cooptation of "thinking differently" is reciprocated by their obedient consumers who return the favor by metabolizing the Apple brand into their personal identities. This entire feedback circuit serves to convince their customers that "originality" is still possible, just like it was for all their pitchmen. *Imagine*…John Lennon endorsing Garageband muzac?

Ironically, John Lennon can be used to sell their computers, but don't try to remix a *Beatles* song on your Mac as its software blocks remixing of its own songs

At the time of this writing Apple's motto, *think different – think like us*, and their homogeneous, hyper-consistent identity has taken its first small blow from the Microsoft response to Apple's *I'm a PC and I wear a suit* ads. These ads were monumental in the evolution of the Apple brand because Apple no longer needed to use celebrity pitchmen. Instead, the product itself had reached celebrity status and could be sold by a generic everyman-type of model. But the ads backfired by virtue of exposing that Apple was guilty of stereotyping the image of PC owners. Apple's flimsy design culture (symbolized by their trendy gen-X model) is confronted with a series of real PC "suits" that symbolize a more mutable, heterogeneous, multicultural…identity mix.

7 "Jean Baudrillard - Cultural Identity and Politics - 2002 3/8" *http://www.youtube.com/watch?v=AZmKCzRR5vU* (accessed October 15, 2008) .

8 Nicholas Bourriaud, *Postproduction* (New York: Lukas & Sternberg, 2002) 87.

9 Image retrieved from: http://images.businessweek.com/ss/06/01/redefining_ceo/source/4.htm (accessed August 12, 2008)

Figure 4 Stills from Microsoft TV commercials juxtaposed with "how to dress like a mac" (2008, 2006)[10]

Nicholas Bourriaud, curator and theorist, wrote *Postproduction* in 2002, a book that cites numerous artworks that appropriated and re-exhibited pre-existing works, an activity that goes back to Duchamp's famous ready-mades. Bourriaud provides numerous examples from the art world, but in his characteristic style, he links contemporary art to popular culture and the socio-economic forces that affect artists. He uses the term "musician-programmer" to refer to the today's digital native, who blurs the distinction of creator/consumer by way of remixing or cutting & pasting pre-existing code.[11] Bourriaud alludes to identity mixing at the conclusion of *Postproduction*:

The musician-programmer realizes the ideal of the collective intellectual by switching names for each of his or her projects, as most DJs have multiple names…more than a physical person, a name now designates a mode of appearance or production, a line, a fiction…[12]

Facebook and MySpace present names, images, and digital material that *mask* identity, but specifically, this mask is more like a remix than a total disguise, because it maintains some transparency to the "original" individual. Social networking involves "friends" that the user connects to in the virtual and real world, causing the construction of digital identity to function more as an overlay, superimposition, or hybrid of a virtual and real person. Remixing is different from a conventional photographic image or mechanical reproduction that raises the typical question of resemblance and aura. With remix, there is a conscious effort to refer to, and expose a deeper representation, and this is precisely how digital portraits are employed on Facebook and MySpace. Rather than a single, consistent representation, it is the transformative, imaginative, and mutable identity *series* that fascinates this generation with digital photography. Photographic remixing has a distinctive aesthetic that presents a dual-image; a picture-of-a-picture that self-criticizes itself, prohibiting it from being accepted at face value by the viewer. On a social networking page, a newly uploaded self-portrait exists within a larger self-portrait consisting of the screen name, friends, relationship status, playlist, past photos, etc.. There is a teleology in contemporary art that anticipated this, epitomized in Magritte's famous representational aphorism: "this is not a pipe." Rather than affirming identity, pictorial representation obliterates it. Of the many artists today who approach photography images in this way, the most relevant to the notion of remix identity, is the work of Cindy Sherman.

Figure 5 Cindy Sherman Photos (top row) juxtaposed with photos from DURK's MySpace page. (2008)

Since the late 1970's to the present day, Cindy Sherman has presented remixes of herself. Viewing her chain of images recalls an existential truth observed by Albert Camus regarding how we come to know the identity of film actors by witnessing them in subsequent, fictional roles. Appropriately Sherman entitles her images "Untitled Film Still…" and then affixes a number, as if to accentuate the continual mutation of identity. Her *Untitled Film Still* series anticipates the mass digital photo-albums brought forth by the convergence of camera phones and social networks. In both Sherman's work and the photo albums of MySpace user DURK (pictured in bottom row of figure 5) a dual-image is present, we see both the actor and the character, a transparency to the "original" Cindy Sherman who is ever adaptable, and most importantly, able to mutate when mixed with a nostalgic, media-image. This is how the world

10 Images retrieved from *http://www.youtube.com/watch?v=eOIBGPOKgus* and *http://www.lifeclever.com/how-to-dress-like-a-mac/* (accessed August 12, 2008).

11 For more information, please see: [iDC] Remix Culture vs. Object-Oriented Culture: A conversation between Lev Manovich and Patrick Lichty, *http://mailman.thing.net/pipermail/idc/2006-April/000345.html* (accessed August 12, 2008)

12 Nicholas Bourriaud, *Postproduction* (New York: Lukas & Sternberg, 2002) 81.

has come to know both Cindy Sherman, and by extension, millions of social networkers like DURK, who primarily exhibit an obsession with self-portraiture, but whose sequences and series of images emphasize a temporality of the image that transforms the individual over time – a remix identity.

Identity Grid, Aesthetic Violence

> "The more they know about you, the less you exist."
>
> — Marshall McLuhan

A favorite anecdote of Baudrillard's when he was explaining his idea of simulation, was to refer to the Borges story of the map that replaces the "real" terrain.[13] So it is with the social networker, that they may diagram themselves so thoroughly, that identity begins to describe its map (as opposed to the other way around). Simulation proceeds from this reversal of content and expression, the real and the map. Remix identity is a response to the violence of the digital image that captures and reduces the fidelity of the original via a process of quantization. It begins with a negation of the very possibility of an original; and does not proceed from a conventional paradigm of representation, but rather from one of simulation, which recognizes that we live in a world of copies-of-copies, and that identity results by differentiation from generic models (one's relative position to established styles, types, genres, etc.).

Recognition that identity results from unique pathways through pre-existing material at first may sound banal, but remix identity uses this construction of an identity "grid" as a means to infer or suggest a plane of transcendence existing in the void of the signified (material that cannot be represented). By not pretending that originality is still possible, identity thus materialized, grounded, and contained, prefigures a line of escape. The previous paradigm of representation, which primarily concerned resemblance, honored the inherent identity of the thing captured in the image. Aesthetic violence results from this over-adherence to an identity grid in either the image or the imagined "reality" of the thing captured, in such a way that one's fixation on "real" material becomes too rigid. The backlash occurs when a social networker's profile page begins to serve as a limitation, rather than a possible expansion, for identity.

The digitized image is at its core, a conversion from smooth, analog qualifications to discrete, measurable quantifications. The bitmapped, pixilated, jaggy, compressed, image symbolizes the spastic bits of transcendence left in our world – think of the video quality of Al-Qaeda's communications. Yet when we become "high-definition" material copies – duplicable, repeatable, beyond the confines of time and space – we seem to surrender the possibility of being anything more. Remix identity offers an escape from these two polarities (the transcendent low-res image vs. the material high res). Consider the distant future when a computer will be capable of scanning the entire "content" of a human brain; if such a process were possible it would only help one appreciate remix identity through the quantifiable results. For we are more than the sum total of our "content," rather it is our *pathways* through knowledge that define us and increasingly, as with a conventional remix of art or music, "flows of content and expression are in a state of conjunction or reciprocal precondition."[14] When a previous form, for example a pop song, becomes the content of a new song, the division breaks down, content becomes not an original song, but rather a new temporal state capable of continual change. McLuhan recognized how an old medium becomes the content of a new one (e.g. the content of writing is speech, the content of print is the written word, the content of the telegraph is print, etc.) Deleuze and Guattari, in one of their rare citations of McLuhan, commend him on this point, as it exposes an increased fluidity between symbol and meaning under capitalism. The negative outcome of this is John Lennon endorsing Apple (exhibited in Figure 3). Yet, there is an opportunity that comes along with this fluidity as well, for it resists the despotic "signifier that strangles and overcodes the flows"[15] of meaning. Remix, through its reciprocal transmutation of content and form becomes the aesthetic and communicational method of choice in a capitalistic society that requires an exchange value for everything. Critics of remix see this only as a problem, whereas supporters see it as a form of detournement, a way of subverting mass media's hegemony over the meaning of cultural symbols by turning them against themselves for the purpose of discourse, dissent, or criticism.

Conventional media, say a vinyl record, was a recording of content (art, music, a chunk of knowledge, or entertainment). When turntables were paired together and vinyl records beat-synced, the combination of two "recordings" resulted in a remix – a previous final form served as the content for a new form. It is no different for digital natives remixing identity, what matters is the power of one's

13 Jean Baudrillard, *Simulations* (Cambridge, Massachusetts: The MIT Press/Semiotext[e], 1983) 1.

14 Gilles Deleuze and Felix Guattari, *Anti-Oedipus: Capitalism and Schizophrenia* (Univ. of Minnesota Press 1983) 241

15 Ibid. 240

combinations. Mixing content can lead to different results: mixing baking soda and vinegar makes for a strong cleaning agent; mixing bleach and ammonia creates a poison that can kill you. The combinatorial richness of our content defines us, but with remix identity, elements are associated and mixed through a quasi-causal[16] process of beat-syncing. Elements retain their heterogeneity, as they can be cross-faded to reveal their independent states; this is significantly different from a process of synthesis, where source elements are causally altered to a degree that is irreversible. Thus today an "original" can be understood as any synthesis that sufficiently hides its source code – like an omelet that cannot be reversed to its prior form as an egg. With remixing, beat-synced elements are acausally combined – two or more heterogeneous tracks are played synchronically, the source elements can be cross-faded by the DJ, accentuating the temporal, emergent state of the record-ed content. Remix identity involves a keen sense of pattern recognition (as opposed to information consumption) and the weaving of intricate patterns becomes identity material per se. *You are not your content; you are the unique pathways through content that become powerful combinations when mixed*. This self-conception is a key insight from the present generation of digital natives – the remix generation.

Mixing content can lead to different results: mixing baking soda and vinegar makes for a strong cleaning agent; mixing bleach and ammonia creates a poison that can kill you.

Brian Massumi, whose writing on identity has been the inspiration for remix identity, found a wonderful example of conventional notions of identity in the US Army tagline: *Be all that you can be.* To this, Massumi responds, "Rewrite the slogan of the US Army: dare to become all that you *cannot* be,"[17] which expresses the dynamism of remix identity. The abovementioned term "identity-grid" comes by way of Massumi as well, and is in this paper correlated with the material of online identity: the playlist, photo-series, friends list, and digital material presented in the context of social networking. To reiterate, over-adherence to the identity grid (when the map creates the terrain) constricts the individual: "Every person is a dissipated individual squirming in handcuffs waiting to escape."[18] The army's old idea of identity (firmly grounded in the mysterious being of the potential individual) no longer serves us in this overloaded information environment. Identity lost sets off a violent backlash; no space for transcendence leads the squirming individual to the only thing they find "real" about themselves – a fundamental adherence to the identity grid. Anything outside the lines of the grid is unacceptable.

From grids to gradients is the method of remix identity. A grid is a unit of measurement, a method for mapping or diagramming an elusive, processual identity. Identity grids are useful to the Remixer as only a reference frame for departure. As a serious social networker remarked, "Facebook is like a mask, MySpace is like a wardrobe,"[19] i.e., a layer that is superimposed over the body. Social networking resembles fashion, as it is a heavily coded transformation that serves to negotiate identity with image. Although bits and bytes are far more mutable than pieces of fabric, the design of one's self-presentation leads to more or less friends in the friends list. In the old days, when the army tagline was true, your uniform was an expression of your inner content, not anymore with remix identity: 'What used to be mutually exclusive identities or behaviors can now overlap quite comfortably in the same body, which may run through an endless series of self-transformations."[20] A living example of Massumi's quotation above is DURK, screen name of a college student and ardent social networker who is an amazing conglomeration of US Army soldier /skateboarder /artist (see his photo series in bottom row of figure: 5 above). The playlist of the social networker today is no longer about strict adherence to a consistent style of music, consistent with the stereotype of the individual. Rather, it is the definition of self by virtue of the *inconsistencies* of the playlist and how the eclectic combination of material in the playlist reflects the unique conglomeration comprising the individual. Digital natives have been criticized for flux and flow between their core values and their outer, political expressions; this is a side-effect of remix identity, where the traditional correlations between identity and image, between content and expression, between archetype and stereotype have been subverted by the mutable flow of bits.

16 Brian Massumi, *A user's guide to Capitalism and Schizophrenia: Deviations from Deleuze and Guattari*. (Cambridge, Massachusetts: The MIT Press, 1992) 113.
17 Ibid.
18 Ibid. 64.

19 This comment was made to me by DURK, pictured in figure: 5 during a video interview.
20 Ibid. 134.

> "This season wannabe rappers abound in white suburbia."[21]
>
> -Brain Massumi

Figure 6: DJ Vlad remix: 2pac vs. John Lennon[22]

A classic example of a cultural-mash-up on YouTube is one by DJ Vlad entitled, *2pac vs. John Lennon*[23] where an audio remix of famed east-coast rapper Tupac Skakur's a cappella track is overlaid with John Lennon's hit "Imagine." The power of this superimposition is amplified by the video mash-up that cross cuts pre-existing video of 2pac and Lennon, in such a way, that the juxtaposition equates the two men. The mash-up perpetuates both men who were assassinated after achieving mega-star fame, albeit in vastly different cultural contexts. This mash-up follows in the wake of DJ Dangermouse's famed remix project *The Grey Album*, which mixed raps from Jay-Z's *The Black Album* over loops from The Beatle's *The White Album*. The interracial overtones of *The Grey Album* became symbolic of the social/political dimension of cultural mixing that many YouTube mash-ups today embrace in the spirit of the melting pot tradition. In fact a recent perusal of the 300+ comments that the *2pac vs. Lennon* video has received, shows that the figure of Obama has now entered the commentary, which further energizes the discussion of racial overtones inherent in the mash-up. There is a historical reason why remix aesthetics are so important to the landscape of YouTube cultural mash-ups. The first widely accepted pop remix was the 1986 Run DMC remix of Aerosmith's "Walk this Way." I recall the sub-cultural tensions that this remix evoked (as I was a 16 year old in white suburbia, with its own growing sub-culture of wannabe rappers). "Walk this Way" bridged a strong cultural polarization between the camps of heavy metal and hip-hop. Now, decades later, there is full cultural hybridization between these two music genres, but that is not to say that there is no anxiety, or even violence that results from this cultural mixing and mashing-up.

Jean Baudrillard's discussion of his idea of aesthetic violence is not a complete theory, but is nonetheless very stimulating. In 2002 he gave a lecture at the European Graduate School entitled *Cultural Identity*. As with all his writings, Baudrillard's notion of aesthetic violence is a thread within his meta-theory of simulacra and simulation. In his lecture he states: "The true violence done to beings and things, the violence of globalization, is not a commercial and economic violence, it is a cultural and aesthetic violence, in the same way that true genetic violence is not that of biological cloning, but of cultural cloning."[24] With his succinct style, this quotation by Baudrillard connects across time to 1968, when Marshall McLuhan was grappling with a world becoming increasingly violent and spastic. In McLuhan's diatribe on war and technology, *War and Peace in the Global Village*, he continually returns to the idea that violence is an outlet for identity in crisis. He says:

> When our identity is in danger, we feel certain we have a mandate for war. The old image must be recovered at any cost. But as in the case of "referred pain," the symptom against which we lash out may quite likely be caused by something about which we know nothing. These hidden factors are the invisible environments created by technological innovation.[25]

Remixing (and by extension, mashing-up) is the most significant aesthetic and epistemological outcome of the

21 Ibid. 135.
22 Image retrieved from *http://www.youtube.com/watch?v=CkNG3Rm2pCg* (accessed October 12, 2009)
23 Ibid.

24 "Jean Baudrillard - Cultural Identity and Politics - 2002 3/8" http://www.youtube.com/watch?v=AZmKCzRR5vU (accessed October 15, 2008).
25 Marshall McLuhan and Quentin Fiore, *War and Peace in the Global Village* (New York: Simon & Shuster Inc. 1968. 1985) 97.

technologies of digital media and the Internet. It is distinct from other similar practices such as sampling, design templates, stock photos and cutting and pasting, by virtue of the fact that a remix (and only remix) overtly exhibits the identity of the preexisting material. In a remix, there is a transparency (either created intentionally or not) to the "original" that is obfuscated in all other digital appropriations. This terminological distinction is important, especially when we move from the definition of remix aesthetics and epistemology to the notion of remix identity. The ability to construct identity, as a superimposition over multiple, heterogeneous identities, especially with cultural overtones, is precisely what keeps multiculturalism from its modernist "universal" tendencies. An embrace of remixing, especially on the most serious level of identity is the answer to a culture/identity that requires differentiation to exist amidst widespread convergence, that threatens with the force of a digital tsunami to obliterate identity-differentiation in every way. Remix identity maintains cultural differentiation through a heterogeneous conglomeration of different identity source tracks.

With the coming of age of digital natives (the remix generation) digital media becomes much more than a set of tools used by the communication and entertainment industries; it is more than a method for networking with friends through the Internet too, for remix identity is a network connection to one's deepest, most authentic feelings of selfhood. The alienation of man from his environment caused a violent backlash in the wars of the mechanical and electrical ages. The hope of remix identity is that with more expressivity, digital pathways to identity can overcome the alienation experienced in the digital age through an acceptance that every person is a heterogeneous mash-up of sorts. The problem intuited by McLuhan and Baudrillard is now a real one, and creativity is needed to transform this fundamental problem of "generalized culturalization" into a new possibility.

…true alienation is that everything would become aesthetic and cultural and in the worst finality, everyday life itself, would become a work of art; in sitcoms, reality TV Shows, or big brother: *Temptation Island*. It all started with Duchamp and now it's ending as generalized culturalization.[26]

The crisis of identity resulting from new technology can only be amended by a *detournement* of technology itself; social networking and YouTube are an aesthetic response to the "generalizing" force that hyper-quantification exerts upon the individual and social psyches. By making possible the remix, digital media presents a line of escape for differentiation and depth in both personal and cultural manifestations of identity.

26 "Jean Baudrillard - Cultural Identity and Politics - 2002 3/8" http://www.youtube.com/watch?v=AZmKCzRR5vU (accessed October 15, 2008).

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Research Informed Design: Process, Experience & Results from Students & Their Audiences: A Case Study

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Abstract

Interactive digital platforms are among the hottest topics in our media-rich culture. News and advertising organizations are working to adapt traditional content models to fit new devices and make use of multimedia content for an increasingly visual and time-starved public. As platforms people use to access media become more sophisticated, so too must the content. Through a research-informed design process, an interdisciplinary group of three professors and 31 undergraduates collected feedback about interactive television and iPhone interfaces designed for multimedia news and advertising. This paper reports trends in user feedback and provides related tips for effective interface design.

Introduction

Both print and broadcast news outlets have begun to view "interactivity" as both a technological concept and a news philosophy through increased development of online-only content, such as interactive graphics driven by animation, videos, blogs, reader-generated content, and games. Likewise, interactive advertising, and most emerging digital media, provides one of the few bright spots for advertising media companies. Digital media channels grew during the past year, while nearly all traditional media recorded declining or flat revenue growth. PQ Media's Alternative Media Matrix tracks spending for 18 alternative and digital media, including interactive TV. In 2007, all 18 segments posted double-digit growth; 12 grew faster than 20 percent. According to *TNS Media Intelligence*, only eight of the 19 mostly traditional media categories it measures grew during 2007.[1]

The digital age has also paved the way for intense collaboration among new sets of partners. For example, traditionally, computer science students pursue careers in software development, web programming, scientific computing, and information technology development. However, there is a plethora of emerging media domains where computer science expertise is absolutely necessary. Computer Science students are increasingly collaborating with interface designers and content creators. Rather than just implementing a given design, computer science students are an active part of the interface design process.

This paper reports a number of related outcomes of a project that involved design, development, and usability tests of new applications for two emerging types of interactive media: 1) an interactive television platform, and 2) a local news application or Apple's iPhone and iTouch. In the spring of 2008, an interdisciplinary group of three professors and 31 undergraduates at Ball State University focused on advertising, computer science, journalism graphics, and broadcast multimedia, collected feedback about interactive television and iPhone interfaces designed for the presentation of multimedia news and advertising content. They employed a research-informed design process and basic usability tests to develop and assess their work, and this paper will report their findings by highlighting trends in user feedback, as well as provide some tips for effective interface design.

Review of Literature

Digital media provides content developers with increasing levels of interactivity, offering opportunities to get closer to audiences than ever before. Interactive advertising, for example, has increased audience participation for several high-profile companies, such as Nokia, Virgin Records, and Jack Daniels. And news outlets from both print and broadcast have jumped headfirst into multimedia storytelling as media convergence and online editions have gained popularity and import among traditional audiences.[2] Likewise, content providers are taking advantage of the rapid growth in platform and device technologies by broadening the number of outlets they target for their products. For example, since the release of Apple's iPhone in 2007, several newspapers have designed Web sites that are optimized for iPhone viewing. In March 2008, the *Chicago Tribune* launched a beta version of its iPhone site. And an iPhone interface and portal by Texterity (www.texterity.com) allows users to view thumbnails that have been optimized for iPhone viewing of more than 50 magazines.

While interactive platforms for television have gained popularity and use in the United Kingdom and New Zealand,[3] platforms in the U.S. have been slow to go beyond what's offered through standard digital video recorders (DVRs), such as Tivo, and satellite and digital cable boxes. Furthermore, although more people than ever are watching more television than ever, they aren't doing so in traditional ways.[4] Rather, they are using video on demand, DVRs, streaming video online, or watching video on other devices, such as iPods or cell phones. Thus, a number of providers are racing to develop the next big interactive content and technologies for TV. For example, Tru2way, developed by Comcast, Siegal+Gale, and CableLabs, is the latest interactive digital cable service delivered over the cable video network. The service includes interactive program guides, interactive ads, games, chat, web browsing, and t-commerce, to name a few, and major cable operators plan to

1 PQ Media. "Alternative Media Spending Growth Accelerates in 2007, Hastening Transition from Traditional to Alternative Advertising & Marketing Strategies." http://www.pqmedia.com/about-press-20080326-amf2008.html (accessed October 5, 2008).

2 Reuters. Study Highlights Importance of Extending Traditional News Brands Online. http://www.reuters.com/article/pressRelease/idUS216962+13-Mar-2008+PRN20080313 (accessed October 16, 2008).

3 David Cutts, "Bargain Interactivity." Prism Business Media's *Broadcast Engineering*. http://broadcastengineering.com/iptv/broadcasting_bargain_interactivity/ (accessed April 10 2008).

4 Thomas J. Colin, "Television's Future." CQ Researcher 17 (2007): 145-168.

provide support for the platform in more than 90 million U.S. homes by the end of 2008.[5]

Similar transformations are occurring in newsrooms across the country as journalists scramble to adapt traditional storytelling methods and news coverage routines to address the perceived demand for interactivity. Burger found that younger audiences perceive online sources of news and information to be as credible as their print counterparts, while older audiences are more apprehensive about online sources.[6] This trend may suggest that as younger audiences get older, online sources will become more and more prominent as primary sources for mass audiences. Likewise, Schaffer explored a number of ways news media are using interactive features and multimedia strategies to engage audiences with the news. In addition to online methods, Schaffer pointed to portable kiosks for surveying public opinions and web cam interaction between audiences and the media outlets that serve them.[7]

The rush to develop and explore leading edge content delivery methods that include a significant amount of interactivity and user choice won't subside soon. And as much attention is being paid to exploring best practices in design and development as there is to the gadgets we use to obtain content. According to Furht et. al., fundamental concepts in the areas of interactive media design, both for content and devices, "include video and audio compression, multimedia data storage and retrieval, networking and synchronization."[8] And, most designers and developers recognize the importance of understanding the differences among platform types, from functionality to design, and technical considerations to user experiences.

By the end of 2008, there will be four billion mobile phone subscribers around the world; that is one-half of the global population. A number of factors drive the adoption of touch screen mobile devices. Consumers are demanding more intuitive user interfaces and personalization options, which are often unavailable on traditional mobile devices. A larger screen size also provides a higher level of consumer experience.

The number and kind of emerging technologies related to interactive media is almost too great and vast to comprehend. In August 2008, Intel and Yahoo announced plans for the Widget Channel, "a television application framework optimized for TV and related consumer electronics devices" that will allow users to access Internet applications designed for TV while watching television programming. The platform will allow users to watch TV, track stocks and sports scores, interact with other viewers and friends, as well as track the latest news and information on interactive TV platform. According to Eric Kim, Intel senior vice president, "TV will fundamentally change how we talk about, imagine and experience the Internet."[9] Likewise, in September, Vivid Sky, producer of handheld devices intended to give sports fans access to replays and statistics introduced an iPhone application that offers an interactive scoreboard that allows fans in the stands access to scores from around the league, instant replays, statistics, and game-related interactive information graphics.[10]

All of this leaves educators with a challenge when it comes to training the next generation of journalists, designers, advertising professionals, and computer science engineers. The market is changing so rapidly that the only real way to stay ahead of, or at least in line with, the curve is to engage students in real-world projects with real-world problems.

Project Goals

The goals for the class were simple: 1) Develop and design fully functional interactive news and advertising applications for an interactive television format and for Apple's iPhone and iTouch devices. Thirty-two students from four majors–computer science, journalism graphics, advertising, and telecommunications–were divided into teams, each with specific responsibilities related to these goals. In addition to design and development goals, the teams also employed a research-informed design model through which content designers, graphic designers, and developers would gain valuable insight from real audiences throughout the design process. By bringing in real audiences throughout the design and content development processes, students gain a more tangible sense of audience. And through this pro-

5 David Temin, "Siegel+Gale Brands Future of Interactive Television." *Reuters*. http://www.siegelgale.com/dialogue/wp-content/uploads/2008/01/tru2way.pdf (accessed January 24, 2008).

6 Marten Burger, "Key Issues Surrounding Interactive Computer Game Interface Design." *Metro* 108 (1996): 37-40.

7 Jan Schaffer, "Interactive Journalism: Clicking on the Future." *APME News*, PEW Center for Civic Journalism. http://www.pewcenter.org (accessed August 1, 2008).

8 Borko Furht and others, "Design Issues for Interactive Television Systems." IEEE Computer, Vol. 28, No. 5, May 1995, pp. 25-39. LexisNexis Academic database (accessed September 2, 2008).

9 CNET Network, "Intel and Yahoo! to Bring the Internet to Television." Business Wire. LexisNexis Academic Database (accessed September 2, 2008).

10 Ken Kerschbaumer, "Vivid Sky iPhone App Delivers for Sports Fans." Sports Video Group. http://www.sportsvideo.org/portal/artman/publish/article_12874.shtml (accessed September 14, 2008).

cess, students are often elated to win audience approval for their work and equally crushed to find out that something they thought would be a hit with consumers was actually a flop. But in this sense, both positive *and* negative feedback, both successes *and* failures amounted to exemplary work and experiences for students.

Project Outcomes

The team achieved all of the goals noted above. At the end of the 16-week semester, we had created a functioning interactive television application and two different iPhone/iTouch applications, complete with interactive news and advertising content. The group also engaged in usability sessions with a total of 50 subjects during the course of the semester. Subjects were recorded as they engaged

At the end of the 16-week semester, we had created a functioning interactive television application and two different iPhone/iTouch applications, complete with interactive news and advertising content.

with the TV and iPhone interfaces, and their comments and feedback were recorded for evaluation. One week after each session, students and professors came together to discuss specific feedback and overall trends from usability subjects, and the teams made decisions regarding which interface functions to redesign for the next round of testing. The section that follows provides an overview of the data collected during each of the four sessions.

Trends in user feedback

In an effort to codify the collection of feedback through five sets of usability sessions, we first transcribed the complete dialogue for each session. In addition to responding to a number of standard questions posed by an interviewer, subjects were also asked to spend a few minutes interacting with the application presented to them and were advised to "think out loud" as they did so, commenting on the process, what they found useful, and what they did not. Responses to this protocol were used to assess trends in usability, and common responses were reviewed and acted upon. When more than 50 percent of the participants provided negative feedback regarding a specific aspect of design, content, or functionality, students were required to make changes to the interface in an effort to address user concerns. Likewise, when more than 50 percent of the participants commented positively about some aspect of the interfaces, those comments were noted and compiled.

The breakdown of participants in each session was as follows:

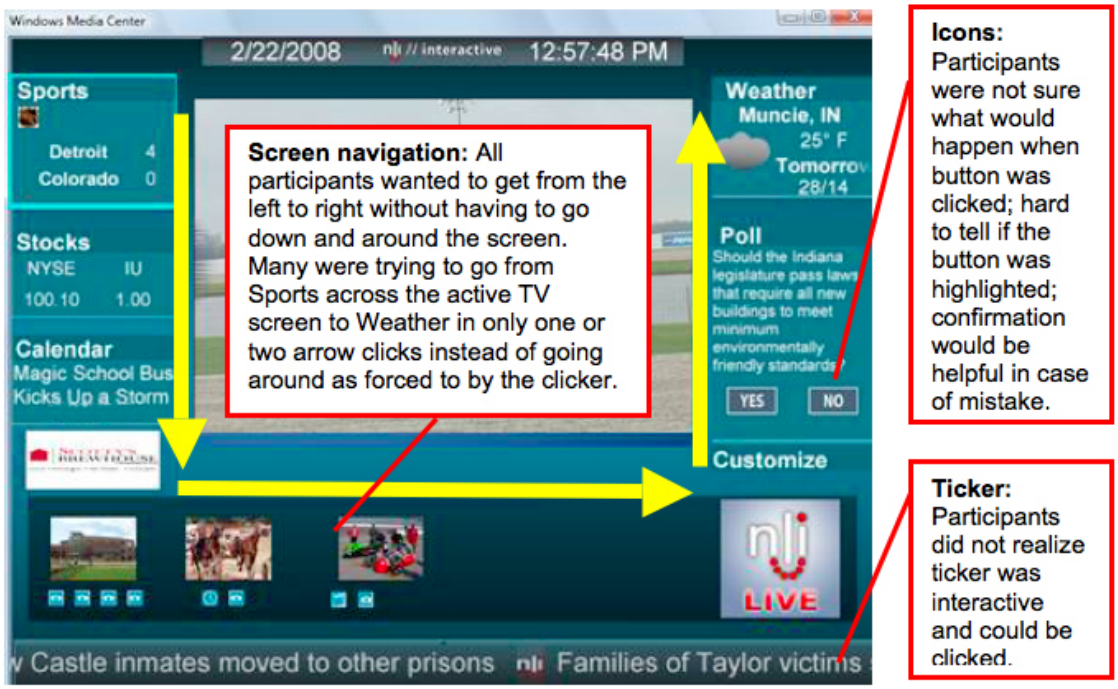
iTV Interface–Group One: 12 participants
iTV Interface–Group Two: 15 participants

iPhone Interface–Group One: 11 participants
iPhone Interface–Group Two: 12 participants

iTV Usability Group No. 1 (12 participants)

A number of key concerns arose from the "think aloud" protocol that was conducted. First, none of the subjects realized the news ticker was designed to be interactive. Thus, an entire array of content was overlooked in all 12 cases. Second, icons that represented interactive content with story packages were often considered confusing. In eight of 12 cases, users reported they either didn't know what the icons meant or they were uncertain about what would happen if they were selected. Third, and perhaps most important, nine of twelve participants were often frustrated and confused by the navigational path they had to take to get from one feature to another. During the periods when they were asked to "think out loud" while they interacted with the interface.

The required compass navigation of the remote combined with three horizontal columns of content and five vertical rows meant users had to click down four times, over three times, and up twice to get from the Sports content in the upper left-hand corner of the screen to the interactive Weather feature in the upper right-hand corner of the screen. Figure 1 reflects this pattern. Designers and developers addressed all of these issues with design and/or functional revisions prior to the next round of usability tests. It's also important to note that in this session, the advertising icon was present, but not interactive. Thus,



while most of the participants noticed it, the cursor jumped over it when they navigated through that section. In the following session, users were able to interact with ads, and responses to that feature were collected and are featured later in this paper.

Q1: How would you rate your overall experience with this application?		
Positive: 6	**Mediocre:** 2	**Negative:** 4
Q2: What did you like best about this application?		
Multimedia content: 3	**Interactive content:** 3	
Ability to multitask: 2	**Customizable content:** 2	
Time & date features: 1	**Interactive ticker:** 1	
Q3: What did you like least about this application?		
Cumbersome navigation: 7	**Confusing buttons/labels:** 3	
Busy design: 1	**Customizable content:** 1	
Q4: Would you like to have this technology in your home for daily use?		
Yes: 10	**No:** 2	
Q5: What is your overall opinion about the design of this application?		
Positive: 9	**Mediocre:** 2	**Negative:** 1
Q6: What is your overall opinion of the news content?		
Positive: 8	**Mediocre:** 3	**Negative:** 1
Q7: Do you think this application is important to the future of television?		
Yes: 8	**No:** 2	**Maybe:** 2
Q8: Do you think this application is important to the future of news?		
Yes: 10	**No:** 0	**Maybe:** 1
Q9: On a scale of 1 to 5, with 1 being "least comfortable" and 5 being "most comfortable," please rate your overall comfort level with this application.		
Average rating: 3.42	**Median rating:** 3.50	
Q10: On a scale of 1 to 5, with 1 being "not at all useable" and 5 being "very usable," please rate how easy this application is to use.		
Average rating: 3.17	**Median rating:** 3.00	

Figure 1 iTV On-Screen Icons, Ticker, and Navigational Pattern

In all sessions, users were also asked a set of specific questions related to the design, content, and functionality of the interface. Table 1 offers an overview of those responses and shows the trends that began to emerge in general feedback.

Table 1 iTV Usability Group One–Responses to Open-Ended Questions

iTV Usability Group No. 2 (15 participants)

In the second set of usability sessions for the television application, users responded to a much different interface design than they did in the first sessions. After carefully considering feedback, designers and developers agreed that because so many participants complained buttons were confusing and navigation was frustrating, it was necessary to radically change the design of the interface. Thus, in some ways, it would be wrong to make a direct aesthetic comparison between what users saw in the first sessions and what they saw in the final sessions because it's really an apples to oranges issue. It's obvious that the visuals provided in Figures 2 and 3 represent a dramatic departure from what we started with.

However, some key comparisons can, indeed, be made between how users are expected to *navigate* the two applications. In the new version, smaller icons with main stories were removed to make more room for the main icons, making them easier to "read." Now, when the user selected a main story, the main icon moved to the left and the other two disappeared, making room for larger sub-icons with accompanying captions explaining that they were linked to additional interactive content related to

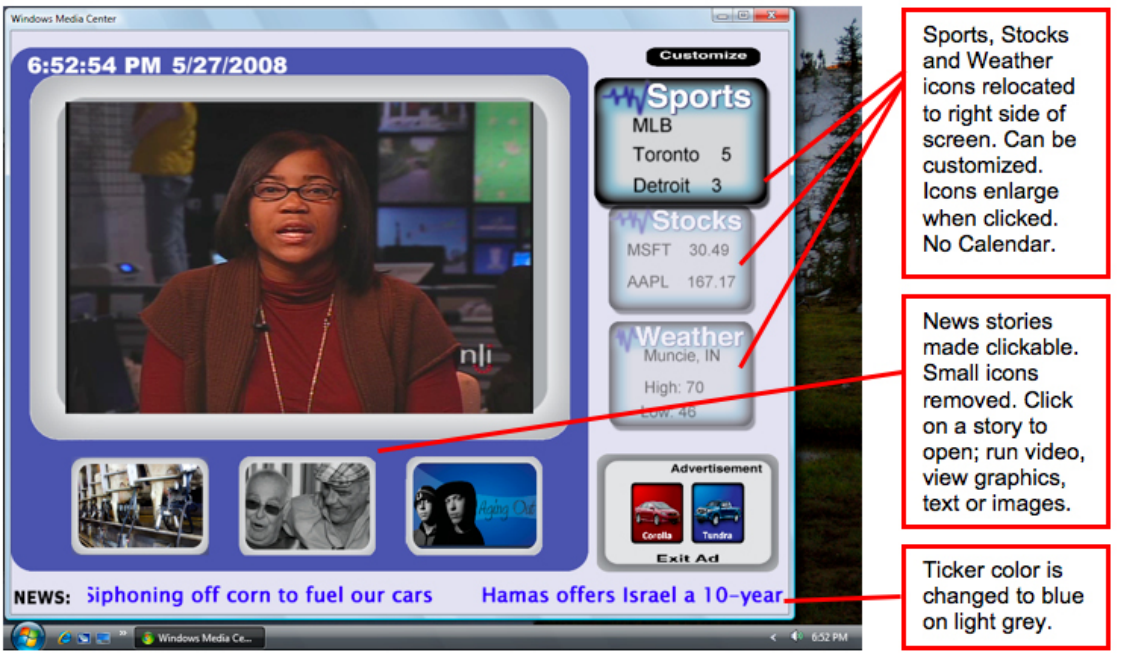


Figure 2 Redesigned iTV Interface

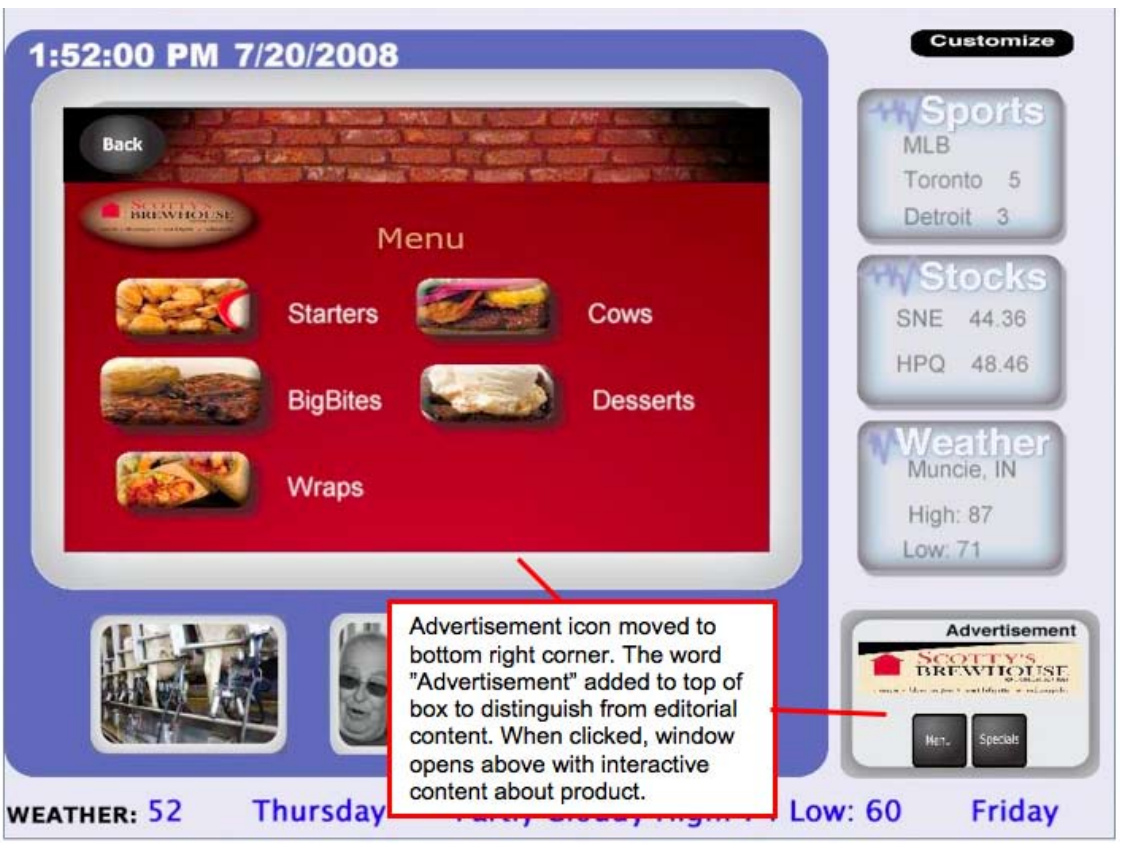


Figure 3 Interactive Advertising Features in Redesigned Interface

that story. Also, the main video viewer was moved to the upper-left hand side of the screen, and the customizable sports, stocks, and weather sections, along with interactive ad links were moved to the right. Now, a user had a clearer path from one portion of the interface to another. The ticker at the bottom of the screen was also visually enhanced by changing the color of the type to blue on a light grey background from grey on a dark green background. Finally, by moving the advertising icon to the bottom right corner of the screen, it became more prominent and more distinguishable from editorial content. In this new version, ad content was also interactive (it was not in the first version), and Figure 3 illustrates one set of interactive features in an advertisement, through which users could view menus and weekly specials for a popular local restaurant. All of the users in this session expressed that they intuitively knew the ad content would be interactive, and they were split 50/50 on whether they actually *wanted* to interact with it. Some comments indicated interest in interaction with ad content. Yet, others expressed a common disdain for the presence of ads. One person noted that he wished he had the option of "getting rid of them from the screen if he wanted to," and others said they didn't care for any kind of TV ads.

The response to navigational patterns was much more positive in this session than previous. Five of 15 users commented that the remote was easy to use and that the layout lent itself to an intuitive understanding of how to navigate through content. However, the overall reaction to the design of this version was mixed, at best. Five of 15 participants expressed that they found the design to be "okay," "not too bad," or "mediocre." And four of 15 participants were very critical of design, noting that they were "not satisfied at all" with the look of the interface and that it was "not really all that modern-looking." Likewise, users still had trouble figuring out what the story icons meant, in some cases causing them to be relatively uninterested in the actual *content.* Finally, even with dramatic changes to the look and function of the interactive ticker, all 15 par-

Q1: How would you rate your overall experience with this application?		
Positive: 8	**Mediocre:** 4	**Negative:** 3
Q2: What did you like best about this application?		
Overall news coverage: 3		**Multimedia content:** 3
Easy to navigate: 3		**Ability to customize content** 2
Overall design: 2		**Aspect of user choice:** 2
Q3: What did you like least about this application?		
Confusing buttons/icons: 8		**Hard to tell what's selected:** 5
Ad button is confusing: 1		**Inability to customize widget:** 1
Q4: Would you like to have this technology in your home for daily use?		
Yes: 7	**No:** 6	**Maybe:** 2
Q5: What is your overall opinion about the design of this application?		
Positive: 3	**Mediocre:** 6	**Negative:** 6
Q6: What is your overall opinion of the news content?		
Positive: 8	**Mediocre:** 4	**Negative:** 3
Q7: Do you think this application is important to the future of television?		
Yes: 8	**No:** 2	**Maybe:** 5
Q8: Do you think this application is important to the future of news?		
Yes: 12	**No:** 2	**Maybe:** 1
Q9: On a scale of 1 to 5, with 1 being "least comfortable" and 5 being "most comfortable," please rate your overall comfort level with this application.		
Average rating: 3.83		**Median rating:** 3.50
Q10: On a scale of 1 to 5, with 1 being "not at all useable" and 5 being "very usable," please rate how easy this application is to use.		
Average rating: 4.00		**Median rating:** 4.00
Q11: Did you notice the ads on the screen?		
Yes: 15	**No:** 0	
Q12: Did you want to be able to interact with the ads?		
Yes: 7	**No:** 8	

Table 2 iTV Usability Group Two–Responses to Open-Ended Questions

All of the users in this session expressed that they intuitively knew the ad content would be interactive, and they were split 50/50 on whether they actually wanted to interact with it.

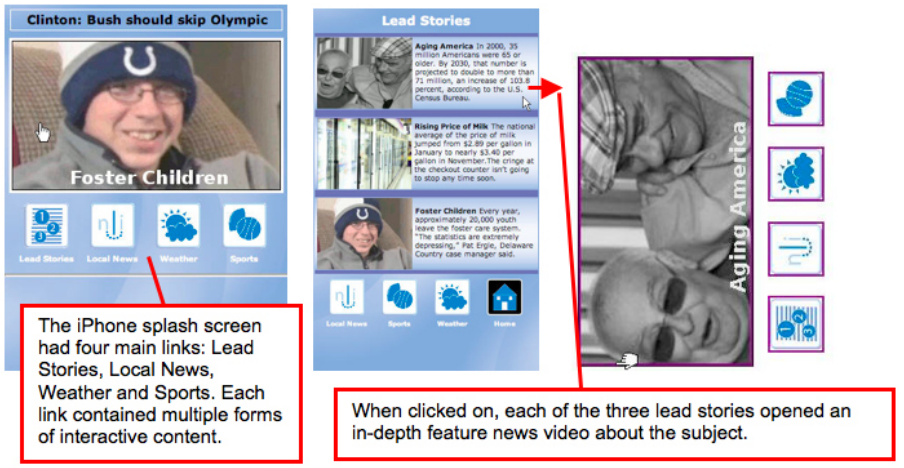


Figure 4 iPhone Design & Navigational Patterns

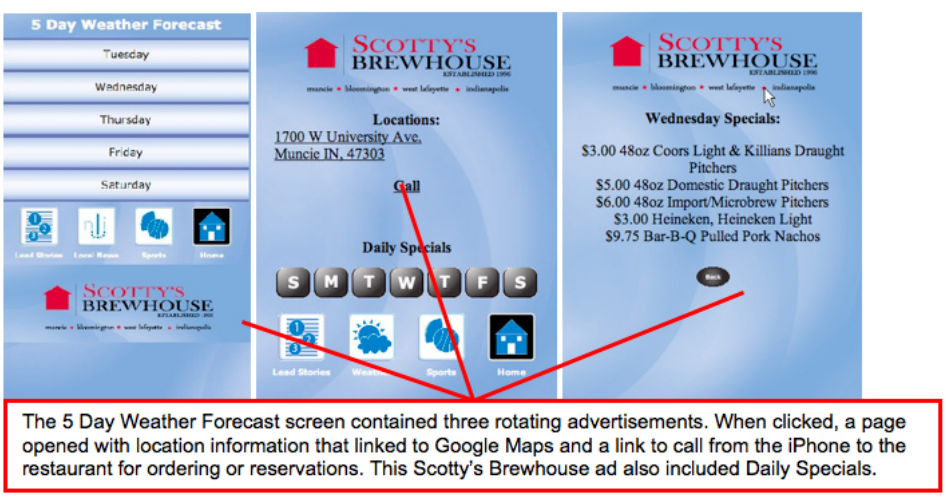


Figure 5 iPhone Interactive Advertising Feature

ticipants completely missed the fact that it was interactive. Yet, when the proctor pointed out to them that they could do as such, all 15 said this was an interesting feature and more than half said they liked this feature.

iPhone Usability Group No. 1 (11 participants)

As noted by Table 3, the overall response to the iPhone application was very positive. Participants generally found the device and this news application very easy to use; they noted the design to be clean and attractive; and they said the news content was engaging and this overall concept important to the future of news. Figure 4 illustrates the overall design and content patterns, and Figure 5 illustrates

Q1: How would you rate your overall experience with this application?
Positive: 8 **Mediocre: 3** **Negative: 0**
Q2: What did you like best about this application?
Interactive content: 5 **Convenient way to get news & information: 3**
Multimedia content: 2 **Easy to navigate: 1**
Q3: What did you like least about this application?
Buttons too small, hard to press: 4 **Difficult to navigate: 3**
Text too small, hard to see: 2 **Not enough control over video: 1**
Limited amount of content: 1
Q4: Would you like to have this technology in your home for daily use?
Yes: 8 **No: 1** **Maybe: 2**
Q5: What is your overall opinion about the design of this application?
Positive: 8 **Mediocre: 2** **Negative: 1**
Q6: What is your overall opinion of the news content?
Positive: 9 **Mediocre: 0** **Negative: 2**
Q7: Is this application is important to the future of viewing video on mobile devices?
Yes: 8 **No: 1** **Don't know: 2**
Q8: Do you think this application is important to the future of news?
Yes: 11 **No: 0** **Don't know: 0**
Q9: On a scale of 1 to 5, with 1 being "least comfortable" and 5 being "most comfortable," please rate your overall comfort level with this application.
Average rating: 3.95 **Median rating: 4.00**
Q10: On a scale of 1 to 5, with 1 being "not at all useable" and 5 being "very usable," please rate how easy this application is to use.
Average rating: 4.18 **Median rating: 4.00**
Q11: Do you recall any sponsorship, product placements or ads?
Yes: 11 **No: 0**
Q12: Do you remember what any of them were for? If so, what do you remember?
Able to recall one of the advertisers: 3
Able to recall two of the advertisers: 4
Able to recall all three advertisers: 3
Unable to recall any advertisers: 1
Q13: Did you think you should be able to interact with ads?
Yes: 7 **No: 2** **Maybe: 2**

advertising features. More than half suggested either that the buttons were too small in places and the overall navigation a bit cumbersome. So, in the second round, designers gave a bit more depth to buttons and reorganized content in small ways. However, overall the design and presentation didn't change significantly in subsequent rounds.

Table 3 iPhone Usability Group One–Responses to Open-Ended Questions

iPhone Usability Group No. 2 (12 participants)

Most participants expressed that they enjoyed the iPhone news and advertising experience, that the interface was easy to use and that the design was strong. Fewer participants–only three of 12–expressed that buttons were too small or hard to press. Likewise, the overall reaction to content was also favorable as all 12 participants expressed that they had a positive experience with the application. However, size in general was still a concern for most users. One participant said there was "too much on each screen. It's cluttered, and the text and buttons have to be too small

Q1: How would you rate your overall experience with this application?
Positive: 12 **Mediocre: 0** **Negative: 0**
Q2: What did you like best about this application?
Convenient way to get news & information: 3
Multimedia content: 3 **Easy to navigate: 2**
Interactive Graphics: 2 **Weather feature: 1**
Sports feature: 1
Q3: What did you like least about this application?
Text too small, hard to see: 5 **Buttons too small, hard to press: 3**
Any content that wasn't local: 2 **Difficult to navigate: 1**
Cluttered design: 1
Q4: Would you like to have this technology in your home for daily use?
Yes: 9 **No: 1** **Maybe: 2**
Q5: What is your overall opinion about the design of this application?
Positive: 8 **Mediocre: 4** **Negative: 0**
Q6: What is your overall opinion of the news content?
Positive: 6 **Mediocre: 6** **Negative: 0**
Q7: Is this application is important to the future of viewing video on mobile devices?
Yes: 9 **No: 1** **Don't know: 2**
Q8: Do you think this application is important to the future of news?
Yes: 12
Q9: On a scale of 1 to 5, with 1 being "least comfortable" and 5 being "most comfortable," please rate your overall comfort level with this application.
Average rating: 4.20 **Median Rating: 4.00**
Q10: On a scale of 1 to 5, with 1 being "not at all useable" and 5 being "very usable," please how easy this application was to use.
Average rating: 4.10 **Median Rating: 4.00**
Q11: Do you recall any sponsorship, product placements or ads?
Yes: 9 **No: 3**
Q12: Do you remember what any of them were for? If so, what do you remember?
Able to recall one of the advertisers: 2
Able to recall two of the advertisers: 5
Able to recall all three advertisers: 2
Unable to recall any advertisers: 3
Q13: Did you think you should be able to interact with ads?
Yes: 8 **No: 3** **Maybe: 1**

because of it." Others noted the "text is too hard to see" and "the small screen with so much content sort of strains my eyes as I try to focus on things." Yet, even those who became frustrated with size generally expressed that they found the interface to be useful, engaging, and an important advancement in news presentation.

Table 4 iPhone Usability Group Two–Responses to Open-Ended Questions

What We Learned

The research team was pleased by the results of the initial usability tests. Although the sample sizes of participants aren't representative of any larger community, the numbers are adequate for usability studies that attempt to draw out major trends in user behaviors, attitudes, and general opinions about an interface. Most usability experts maintain

that with five users, you can begin to find about 85 percent of the problems that will trip up 1/3 or more of your users. And real trends in usability can begin to emerge in samples of 10.[11] Thus, we believe we uncovered a number of specific points related to these specific interfaces that are significant and that could be applicable to our and other's future endeavors in related research and development. Following is a breakdown of these points by interface.

Interactive Television

Users were generally intrigued by the concept of interactive news and advertising with customizable content. And based on the fact that 17 of 27 expressed they would like to have this technology in their homes for daily use, 16 thought this type of application is important to the future of television, and 22 reported they thought this type of application is important to the future of news, it's safe to say that this type of application may be of value to a larger audience. Likewise, in spite of navigational concerns in the first session and design flaws in the second, about half of the users reported having a positive experience, with only seven reporting a negative experience. It's also worth noting that although the redesigned version included a much clearer navigational path for users, designers were still able to include all of the original multimedia content by creating layers for stories that started with a single icon that when selected revealed a branch of additional content available to users. Although they may have failed with the new aesthetic, there was a clear improvement in users' ability to move through the interface with little hesitation or confusion. This may suggest that when a compass (left-right, up-down) navigational system is present, as is the case when a television remote is the tool for navigation, a design should be either heavy on left-right paths or heavy on up-down paths, but not heavy on both. The first interface navigated in a U-pattern, leaving a user with significant up-down, left-right action. However, the second interface, made use of an L-shaped pattern, eliminating a whole level of up-down navigation and favoring a left-right clicking pattern.

The use of icon buttons as both a tool of content (in that they attempted to illustrate what a story was about) as well as a tool of navigation (in that they were clickable, revealing additional story layers) was problematic in both versions of our interactive television interface. It's often difficult, and in some cases impossible, to translate an entire story's meaning in a single visual. And, explaining the icons with type is equally problematic because that method takes up a great deal of space and requires that a user *read* type on a television screen. They're willing to do the latter in small doses. But it's not a preferred method of TV viewing. Given that 11 of 27 participants noted that the confusing buttons were their *least favorite* part of the interface and 20 of 27 mentioned their dissatisfaction with the buttons at some point during their protocols, finding an appropriate method for this concept should be a goal in future iterations of our project.

Given the fact that all 27 participants had to be told that the ticker was interactive, a "how to use this interface" tutorial stored somewhere in the application might be a valuable addition to any such program. It's interesting, though, that once they were told about ticker interactivity, most were more than a little intrigued by the idea. This may suggest that since scrolling tickers are generally elements that simply move across the screen and can easily be ignored, most users have no intuitive reason to believe they can interact with one. But, it may also suggest that the idea of being able to expand ticker content from single sentence fragments to extended stories if a user is interested in learning more about a particular item could be extremely attractive.

Finally, advertisements were used in the interactive television programming in two ways: as short promotional videos inserted at the beginning of feature news segments, and as stand-alone ads on the bottom of the screen that, when clicked, provided information about local products and services. The key to effective use of interactive advertising requires that the ads be integrated into on-screen news and information content. Interactive TV advertising requires the use of a pull-marketing strategy versus a push strategy used with traditional advertising.

iPhone

The iPhone news and advertising interface was overwhelmingly successful with our users. Twenty of 23 users reported a positive experience, with interactive and multimedia content (12) and convenience (6) topping the list of features users liked best. Likewise, 17 reported that they would like to have this type of application available to them for daily use, 17 said they thought this application would be important to the future of viewing video on mobile devices,

11 Jakob Nielsen and Thomas K. Landauer, "A mathematical model of the finding of usability problems." *Proceedings of INTERCHI* 1993. New York: Association for Computing Machinery, 1996: 206-213.

and all 23 affirmed that this type of application is important to the future of news. In this regard, news organizations–print and broadcast alike–should take notice of the mobile device's potential for shaping how audiences consume news and information in the years to come. Add to this that 20 users noticed ad content, all but four could remember the names of advertisers they encountered, and 15 felt they should be able to interact with ads, and you may have an equation for a successful news and advertising model, an obviously attractive for news outlets who have struggled in recent years to figure out a viable model for making money on the Web.

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Keywords

analogy, content-based search, image similarity, user study

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Towards a Transmedia Search Engine: A User Study on Perceiving Analogies in Multimedia Data

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AbstractThe World Wide Web has become effective for archiving and sharing multimedia, but search engines typically rely on text for search and focus on exact matches within a single media form. Human cognition is much more complex. We use visual or phonetic comparisons and often perceive similarities between different media forms and find analogies in non-literal matches. Our goal is to develop a Transmedia Search Engine that suggests analogies across different media (e.g., audio, images, videos) by looking for structural similarity within media content. To achieve this goal, we are studying how people perceive similarity between and within media forms. We describe the development and results of two surveys on similarity between images. Our results show that subject and shape are leading factors in determining similarity.

Introduction

We are inspired by the ability of artists and designers to find analogies between diverse artifacts and bring them together to compose a coherent and novel narrative. An extreme form of this ability is the neurological condition known as *synaesthesia* in which two or more senses are crossed (e.g., when seeing a color causes one to hear a sound). In addition to highly-regarded artists who are synaesthetic (e.g., Kandinsky), there are also many examples of attempts to reproduce the effects of synaesthesia in art and entertainment (e.g., the video game Rez[1]). Inspired by this phenomenon, we are building a Transmedia Search Engine to enable the exploration of analogies in mixed-media content. To find the most effective algorithms to achieve this goal, we are studying how people perceive analogies between and within media forms (audio samples, images, and videos). In this paper, we describe the development and results of two surveys that we have conducted on analogies between images.

The practice of correlating different media forms has appeared throughout art history and has become even more significant in the last few decades as digital media technology has matured. An early example of analogy between different art forms is the relationship between Miro paintings and Calder sculptures. More recently, different media forms have been fused in mixed-media installations, theatre, concerts, and in visual music[2] where one media form (e.g., an animation) is constructed to synchronize with another (e.g., music).

The emergence of the World Wide Web as a storehouse for archiving and sharing multimedia data has enabled a different mindset – that of gathering (and adapting) existing media content rather than synthesizing new media content to build a coherent mixed-media narrative. To do so, efficient algorithms are needed to search multimedia data. Most search algorithms are text-based and rely on filenames or text tags attached to the file. Those that do not rely on text are content-based approaches that rely on meta-data extracted from the media content. There are two limitations of existing text-based and content-based search engines that our research aims to address: (1) existing search engines focus on literal and exact matches, and (2) they do not compare different media forms. Human cognition is much more complex, however. We typically use visual or phonetic comparisons that are then secondarily translated into language for further communication. Further, we often perceive similarities between different media forms and find analogies in non-literal, inexact matches.

The goal of our Transmedia Search Engine is to enable people to discover non-literal connections between text, audio samples, images, 3D geometry, and videos. It is based on the psychological notion of transderivational search, which is a fuzzy match that enables people to find contextual meaning in every stimulus and forms a primary component of human language and cognitive processing. Once built, the Transmedia Search Engine will form the core of brainstorming and discovery tools for artists to help them make mental associations in design tasks such as gathering media artifacts for a thematic installation from an archive of media samples. As artists navigate this design space, the search engine will present unexpected media possibilities. In another potential application, the search engine can be part of an interactive environment that matches the social pattern (geometry, position, and motion) of participants to media samples that are then displayed in the environment as shown in Figure 1 on the opposite page.

We now review current trends in search engine technology and pattern matching algorithms that use meta-representations to find similar patterns rather than exact matches. We emphasize that this report does not present a working Transmedia Search Engine, but rather, introduces the concept of such a search engine, describes the limitations of existing search technology, and presents the results of user studies on perceiving analogies that will inform our design of algorithms toward a Transmedia Search Engine. We describe the development of the user studies in Section III and discuss the results in Section IV.

Related Work

The World Wide Web has become a reliable and fast way to archive and share multimedia data. Most search engines (e.g., Google) are text-based and rely on filenames or text tags attached to the file to search multimedia data. Within the last five years, however, many content-based search algorithms have been developed that do not rely on text,

1 Andrew Vestal, "Rez," *The Gaming Intelligence Agency* (2002), http://microscopiq.com/extras/Rez.html (accessed March 3, 2009).

2 Oskar Fischinger (director). *Oskar Fischinger: Ten Films*, 2006, Wayne Lytle (director), *Animusic: A Computer Animation Video Album*, 2001, and J. B. Mitroo, Nancy Herman, and Norman I. Badler, "Movies From Music: Visualizing Musical Compositions", *Proceedings of 6th International Conference on Computer Graphics and Interactive Techniques (SIGGRAPH)*, (1979):218-225.

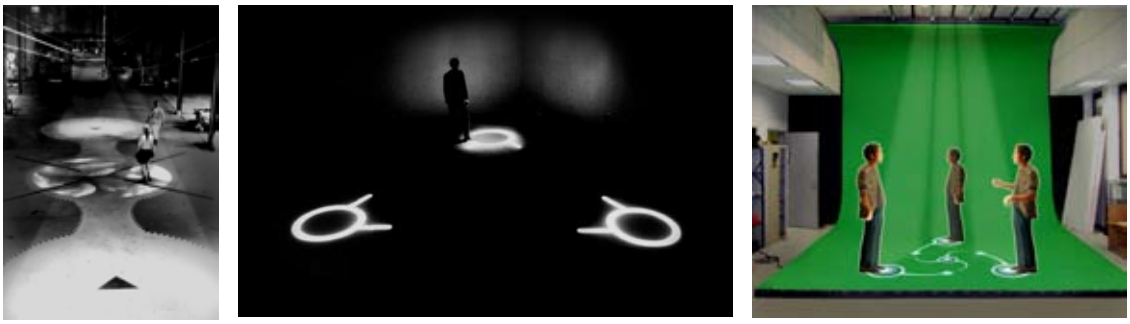


Figure 1 Examples of using search in mixed-media installations. Installations at the Flytrap Gallery and Test-Site Gallery in Brooklyn, NY (left, center). Mock-up of interactive installation in the green-screen room at Stevens (right).

and instead compare media content using pattern-matching algorithms.

Content-based Search

Content-based approaches have been developed for retrieval, categorization, and automated annotation of images[3] and video.[4] Non-textual search engines have also been developed for music[5] and 3D shapes.[6] These approaches focus on categorical and literal matching and do not compare different media forms. Related work that does make use of multimedia data are those that integrate multimodal sensor data (e.g., audio and video) to improve tracking and surveillance.[7] Although our goals differ, the meta-data (e.g., local geometric features[8,9]) these methods extract to compare media of a common form may be useful in comparing different media forms and finding non-literal associations.

3 Riya Visual Search. http://www.riya.com (accessed March 3, 2009); Kobus Barnard and David A. Forsyth, "Learning the Semantics of Words and Pictures," *Proceedings of International Conference on Computer Vision (ICCV),* 2 (2001):408-415; Ritendra Datta, Dhiraj Joshi, Jia Li, and James Z. Wang, "Image Retrieval: Ideas, Influences, and Trends of the New Age," ACM Computing Surveys (CSUR), 40 No 2 (2008):Article 5; Yong Rui, Thomas S. Huang, and Shih-Fu Chang, "Image retrieval: Current Techniques, Promising Directions and Open Issues", Journal of Visual Communication and Image Representation, 10 No 1 (March 1999):39-62; Arnold Smeulders, Marcel Worring, Simone Santini, Amarnath Gupta, and Ramesh Jain, "Content-based Image Retrieval at the End of the Early Years", IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), 22 No 12 (2000):1349-1380; and Remco Veltkamp and Mirela Tanase, "Content-based Image Retrieval Systems: A Survey", Technical Report UU-CS-2000-34, Department of Computing Science, Utrecht University, 2000.

4 Philippe Aigrain, Hongjiang Zhang, and Dragutin Petkovic, "Content-based Representation and Retrieval of Visual Media: a State of the Art Review", *Multimedia Tools and Applications*, 3 No 3 (1996):179 – 202; Shih-Fu Chang, Qian Huang, Thomas Huang, Atul Puri, and Behzad Shahraray, "Multimedia search and retrieval", *Advances in Multimedia: Systems, Standards, and Networks*, edited by Atul Puri and Tsuhan Chen, New York: Marcel Dekker, 1999; and James Z. Wang and Nozha Boujemaa (eds). *Proceedings of ACM SIGMM 8th International Workshop on Multimedia Information Retrieval (MIR)*, 2006.

5 Midomi. http://www.midomi.com/ (accessed March 3, 2009).

6 Princeton Shape Benchmark. http://shape.cs.princeton.edu/benchmark (accessed March 3, 2009), and Robert Osada, Thomas Funkhouser, Bernard Chazelle and David Dobkin, "Shape Distributions", *ACM Transactions on Graphics*, 21 No 4 (2002):807-832.

7 Zohar Barzelay and Yoav Y. Schechner, "Harmony in Motion", *Proceedings of Conf. Computer Vision and Pattern Recognition (CVPR)*, 1 (2007):1-8; Adam O'Donovan, Ramani Duraiswami, and Jan Neumann, "Microphone Arrays as Generalized Cameras for Integrated Audio Visual Processing", *Proceedings of the Conference on Computer Vision and Pattern Recognition (CVPR)*, (June 2007):1-8; and Zhigang Zhu, Tom S. Huang, and Ying-li Tian (eds). *Proceedings of IEEE Workshop on Multimodal Sentient Computing: Sensors, Algorithms and Systems (WMSC07)*, part of the *Conference Computer Vision and Pattern Recognition (CVPR),* 2007.

8 Krystian Mikolajczyk and Cordelia Schmid, "A Performance Evaluation of Local Descriptors", *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 27 No 10 (October 2005):1615-1630.

9 Simon A.J. Winder and Matthew Brown, "Learning Local Image Descriptors", *Proceedings of Conference Computer Vision and Pattern Recognition (CVPR)*, (2007):1-8.

Related to content-based search are methods that integrate both semantics (in the form of text) and content for organizing an image collection.[10] These approaches primarily deal with image databases. They attempt to learn relationships between text and image features such as the color histogram or segmentations of an image and use these relationships to perform text queries on the database and cluster images into categories.

Analogy-Finding

Content-based retrieval algorithms strive to identify or categorize media content given a media sample. In contrast, the goal of our Transmedia Search Engine is to find non-literal, inexact matches. Few algorithms address this goal, but one that does for images is that of Shechtman and Irani who extract meta-data that preserves structural similarity while being invariant to absolute appearance information such as color and texture.[11] The resulting matches are similar while being non-literal and inexact, which is what we would like to achieve across different media forms.

Methodology

To build a Transmedia Search Engine that suggests analogies in a content-based (rather than textually-based) manner, we need to build algorithms that can extract meta-data from media content and compare media samples based on that meta-data as shown in Figure 2.

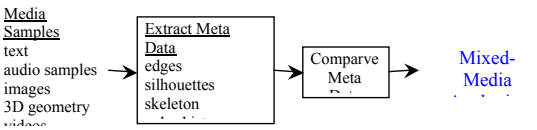


Figure 2 Transmedia search pipeline

For images, meta-data might be in the form of edges or silhouettes extracted from the image that defines the shape of objects therein. A histogram of the color content of an image or video is another example of meta-data. Ideally, the meta-data should record information related to how analogies are perceived. To find out what meta-data should be used in our Transmedia Search Engine, we have developed two user studies on perceiving analogies, focusing on five different visual elements: subject, shape, color, tone (lightness/darkness), and texture.

Visual Elements

The five visual elements we focus on are the primary components of formal composition upon which critical analysis of artwork is based. These elements have also been identified by researchers in visual perception, neurophysiology, and computer vision as integral to the process of object recognition and identification.

Researchers in visual perception have identified two key steps in the process of visual object recognition. These are object detection and categorization.[12] Detection involves low-level visual processing such as extracting edges and segmenting objects in the foreground from the background.[13] Categorization involves high-level cognitive processing to group a detected object with existing objects

10 Kobus Barnard and David A. Forsyth, "Learning the Semantics of Words and Pictures", *Proceedings of International Conference on Computer Vision (ICCV)*, 2 (2001):408-415; Kobus Barnard, Pinar Duygulu, and David A. Forsyth, "Clustering Art", *Proceedings of the Conference on Computer Vision and Pattern Recognition (CVPR)*, 2 (2001): 434–441; Ron Bekkerman and Jiwoon Jeon, "Multi-modal Clustering for Multimedia Collections", *Proceedings of the Conference on Computer Vision and Pattern Recognition (CVPR)*, 1 (2007):1-8; Deng Cai, Xiaofei He , Zhiwei Li , Wei-Ying Ma, and Ji-Rong Wen, "Hierarchical Clustering of WWW Image Search Results Using Visual, Textual and Link Information", Proceedings of the 12th International Conference on Multimedia, (2004):1919-1932; Nicolas Loeff, Cecilia O. Alm, and David A. Forsyth, "Discriminating Image Senses by Clustering with Multimodal Features", *Proceedings of COLING/ACL*, (2006):547-554; and Yukio Uematsu, Ryoji Kataoka, and Hiroshi Takeno, "Clustering Presentation of Web Image Retrieval Results Using Textual Information and Image Features", *Proceedings of the 24th IASTED International Conference on Internet and Multimedia Systems and Applications*, (2006):217-222.

11 Eli Shechtman and Michal Irani, "Matching Local Self-similarities Across Images and Videos", *Proceedings of Conf. Computer Vision and Pattern Recognition (CVPR)*, (2007):1-8.

12 J. Driver and G.C. Baylis, "Edge-assignment and Figure-ground Segmentation in Short-term Visual Matching", *Cognitive Psychology*, 31 (1996):248-306; Ken Nakayama, Zijiang J. He, and Shinsuke Shimojo, "Visual Surface Representation: A Critical Link Between Lower-level and Higher-level Vision", In *An Invitation to Cognitive Science: Visual Cognition*, edited by Stephen M. Kosslyn and Daniel N. Osherson, 1-70. Cambridge, MA: MIT Press, 1995; and Thomas J. Palmeri and Isabel Gauthier, "Visual Object Understanding", *Nature Reviews*, Neuroscience, 5 (April 2004):291–303.

13 Min C. Shin, Dmitry B. Goldgof, and Kevin W. Bowyer, "Comparison of Edge Detector Performance Through Use in an Object Recognition Task", *Computer Vision and Image Understanding (CVIU)*, 84 No 1 (2001):160-178.

in the knowledge base. The computer vision community has developed many algorithms to perform these steps for automated object recognition in images and videos. In our study, these two crucial steps map to the visual elements of subject (for categorization) and shape (for detection).

Interestingly, color and form are processed in different areas of the cortex, and studies have shown that color actually enhances recognition.[14] Color is also known to improve low-level vision tasks such as edge detection and object segmentation.[15] With regard to texture, studies by neurophysiological researchers have shown that neurons in primate visual systems respond to texture in addition to color and shape.[16] Finally, the visual element of tone or lightness/darkness affects perceived shape and subject matter.[17]

Online Surveys

We conducted two types of surveys. The first is designed to capture participants' visceral reactions on how two media samples relate, while the second delves deeper into why two media samples are perceived as similar. At present, our surveys allow participants to compare only images. In future work, we will conduct surveys on perceiving analogies between media of different forms such as between an image and video segment or an image and a 3D model.

The surveys are web-based and run locally on an APACHE web server. In future work, we will launch these surveys on the web for a larger user study. SQLite is used for data storage. HTML, PHP, CSS, JavaScript, and Flash are used to display and format the surveys.

14 K.R. Gegenfurtner, and J. Rieger, "Sensory and Cognitive Contributions of Color to the Recognition of Natural Scenes", *Current Biology*, 10 (2000):805-808; Ian Spence, Patrick Wong, Maria Rusan, and Naghmeh Rastegar, "How Color Enhances Visual Memory for Natural Scenes", *Psychological Science*, 17 No 1 (2006):1-6.

15 Ione Fine, Donald I.A. Macleod, and Geoffrey M. Boynton, "Surface Segmentation Based on the Luminance and Color Statistics of Natural Scenes", *Journal of the Optical Society of America*, 20 (2003):1283-1291.

16 E. Kobatake and K. Tanaka, "Neuronal Selectivities to Complex Object Features in the Ventral Visual Pathway of the Macaque Cerebral Cortex", *Journal of Neurophysiology*, 71 (1994):856-867; Nikos K. Logothetis, J. Pauls, Heinrich Bulthoff, and Thomas Poggio, "View-dependent object recognition by monkeys", *Current Biology*, 4 (1994):401-414; and Bartlett W. Mel, "SEEMORE: Combining Color, Shape, and Texture Histogramming in a Neurally Inspired Approach to Visual Object Recognition", *Neural Computation*, 9 (1997):777-804.

17 Barton L. Anderson and Jonathan Winawer. "Image segmentation and lightness perception", *Nature (Letters to Nature)*, 434 No 7029 (2005):79-83.

Survey I

Recent studies have shown that detection involving low-level vision and categorization involving cognition are closely coupled and are often performed simultaneously.[18] Although there is still debate about whether detection necessarily occurs before categorization, identification has been found to require more processing time. In the context of a search engine, identification leads to exact matches, whereas detection and categorization lead to inexact,

We conducted two types of surveys. The first is designed to capture participants' visceral reactions on how two media samples relate, while the second delves deeper into why two media samples are perceived as similar.

18 Kalanit Grill-Spector and Nancy Kanwisher, "Visual Recognition: As Soon As You Know It Is There, You Know What It Is", *Psychological Science*, 16 No 2 (2005):152-160; Eric Halgren, Janine Mendola, Catherine D.R. Chong, and Anders M. Dale, "Cortical Activation to Illusory Shapes as Measured with Magnetoencephalography", *NeuroImage*, 18 (2003):1001-1009; Shaul Hochstein and Merav Ahissar, "View From the Top: Hierarchies and Reverse Hierarchies in the Visual System", *Neuron*, 36 (2002):791-804; Jia Liu, Alison Harris and Nancy Kanwisher, "Stages of Processing in Face Perception: An MEG Study", *Nature Neuroscience*, 5 No 9 (September 2002):910-916; and Michael L. Mack, Isabel Gauthier, Javid Sadr, and Thomas J. Palmeri, "Object Detection and Basic-level Categorization: Sometimes You Know It Is There Before You Know What It Is", *Psychonomic Bulletin & Review*, 15 No 1 (2008):28-35.

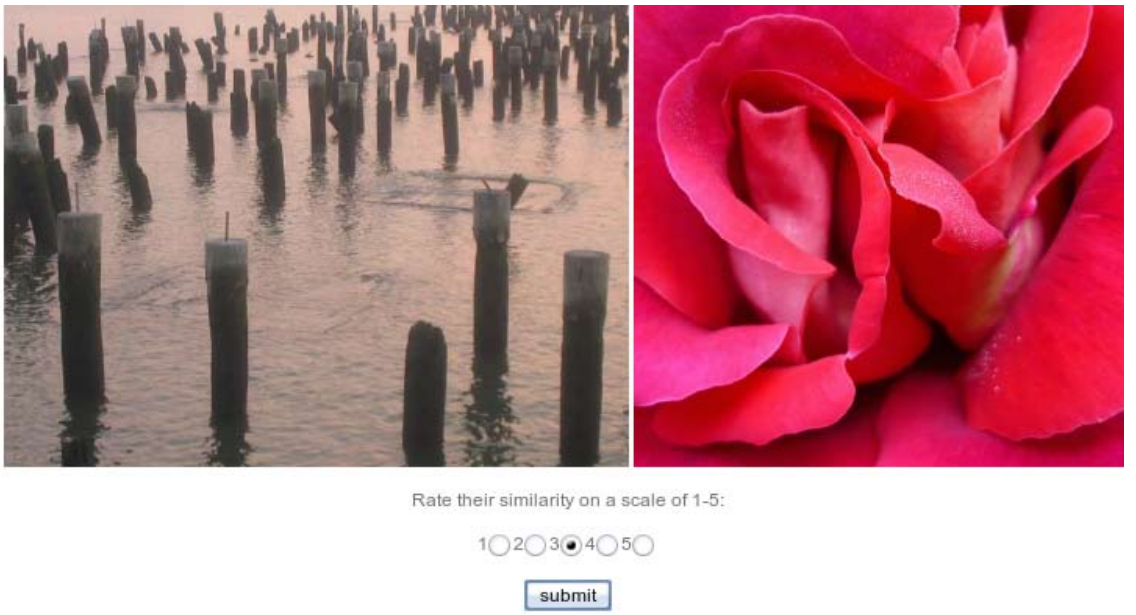


Figure 3 Survey i

possibly non-literal, matches. To capture the visceral perception of categories, our first survey records perceived similarity without reference to visual elements (Figure 3). The survey displays two random images and asks participants to rate the similarity on a scale of 1 (not similar) to 5 (very similar). Survey participants were asked to spend no more than five minutes comparing each pair of images, and the response time was three minutes on average. Thirty six participants spent approximately one hour each to rate an average of 1000 pairs of images.

Survey II

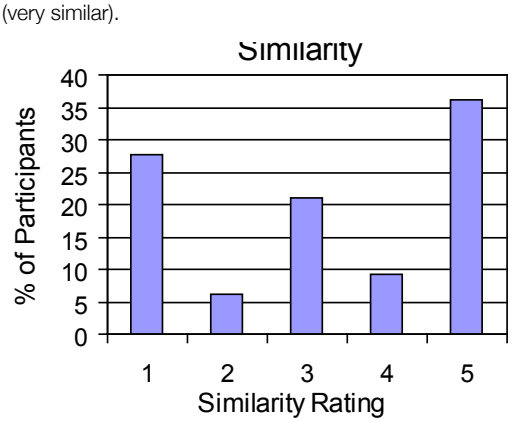
The goal of the second survey is to determine which of the five visual elements are most influential in perceiving analogies or similarity between images. To do so, participants are shown six images and asked to choose the two most similar pair. They are then asked how the five visual elements (subject, shape, color, texture, and tone) affected their selection by rating how similar each element is in the selected pair of images on a scale of 1 (not similar) to 5 (very similar). Survey participants were asked to spend no more than 5 minutes selecting and rating each pair of images. Participants can ask for a new set of six images as many times as needed if they did not perceive any pair to be similar. In our study, new image sets were requested 66% of the time. 40 participants rated an average of 1000 pairs of images.

Results and Discussion

We now discuss the results of our surveys and the conclusions we can infer from the data.

Survey I

Images were found to be similar 72% of the time. The following plot shows how participants rated the similarity of a pair of random images on a scale of 1 (not similar) to 5 (very similar).

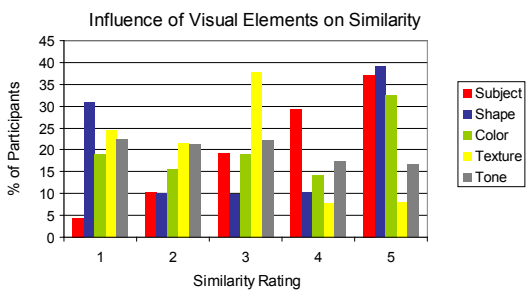


Approximately 1/3 of the responses indicated that the images are very similar (rating of 5), 1/3 indicated little or no similarity (rating of 1 and 2), and approximately 1/3 found some similarity (rating of 3 and 4), reflecting the diversity

in the data. Results reveal that given two image samples, people tend to find some similarity (rating or 1 or higher) and that there may be a psychological bias towards looking for and finding similarity. Although Survey I is not particularly informative about how non-literal similarities are perceived, it does positively indicate that inexact, or analogical, matches are perceived and should be pursued. As we describe next, our second survey leads to more interesting conclusions on perceiving similarity.

Survey II

The results of our second survey are shown in the following plot. The similarity rating on a scale of 1 (not similar) to 5 (very similar) for each element is plotted against the percentage of participants who chose each rating. The ratings essentially reveal the influence of the visual element on perceiving similarity since participants rate the visual elements only once they have deemed a pair of images to be similar.



Based on the findings in the plot above, we make the following conclusions:

By examining the highest rating of 5, we see that subject, shape, and color are most often identified as the reason for perceiving similarity.

Based on the trend for each visual element, we see that subject (with the smallest percentage of "no similarity" or 1 rating), correlates most consistently with the perception of similarity.

The shapes in the images are either very similar or not similar at all, indicating that people may find image pairs to be similar despite having completely different shapes (most likely, subject and/or color were perceived to be similar in these cases). This result also indicates that shape is strongly perceived to be similar or different, and not often perceived to be just mildly similar.

Texture and tone do not appear to be highly correlated with similarity, and their ratings follow normal and nearly constant curves, respectively.

Although Survey II does not directly measure it, we make the intuitive conclusion that for more abstract image pairs, shape and color are likely to be influential, whereas for representational image pairs, subject dominates.

To further analyze the survey data, we have correlated the different visual elements. In the following table we record the percentage of time when two visual elements are identified as being very similar (rating of 5) in a pair of images. Each cell is the percentage of time that the associated row's visual element was rated as very similar given that the column's visual element was rated as very similar. For example, when subject was rated as very similar (first column), texture was also rated as very similar only 2% of the time.

(Row & Col.)/Col.	Subject	Shape	Color	Texture	Tone
Subject		67	72	19	27
Shape	71		35	56	48
Color	63	29		22	49
Texture	2	12	5		7
Tone	12	20	25	14	

Table 1-Correlation (%) of visual elements

The correlation percentages reveal which visual elements can be used as indicators of others. Subject is a strong indicator that shape is also similar by 71% and visa versa by 67%. This information is vital in that it enables us to infer the similarity of one visual element based on another. For example, we can infer subject similarity based on shape similarity (with 67% confidence) and rely on computer vision algorithms to robustly measure shape similarity in our Transmedia Search Engine.

Future Work

We have described user studies we have conducted on perceiving similarity in images. Our results show that subject and shape are leading factors in determining similarity and are highly correlated. The results will inform our design of algorithms toward an analogical search engine that we call the Transmedia Search Engine. Our next step is to conduct surveys using different media forms (e.g., images and video segments, and images and 3D shapes) and to launch the surveys on the web for wider audience participation.

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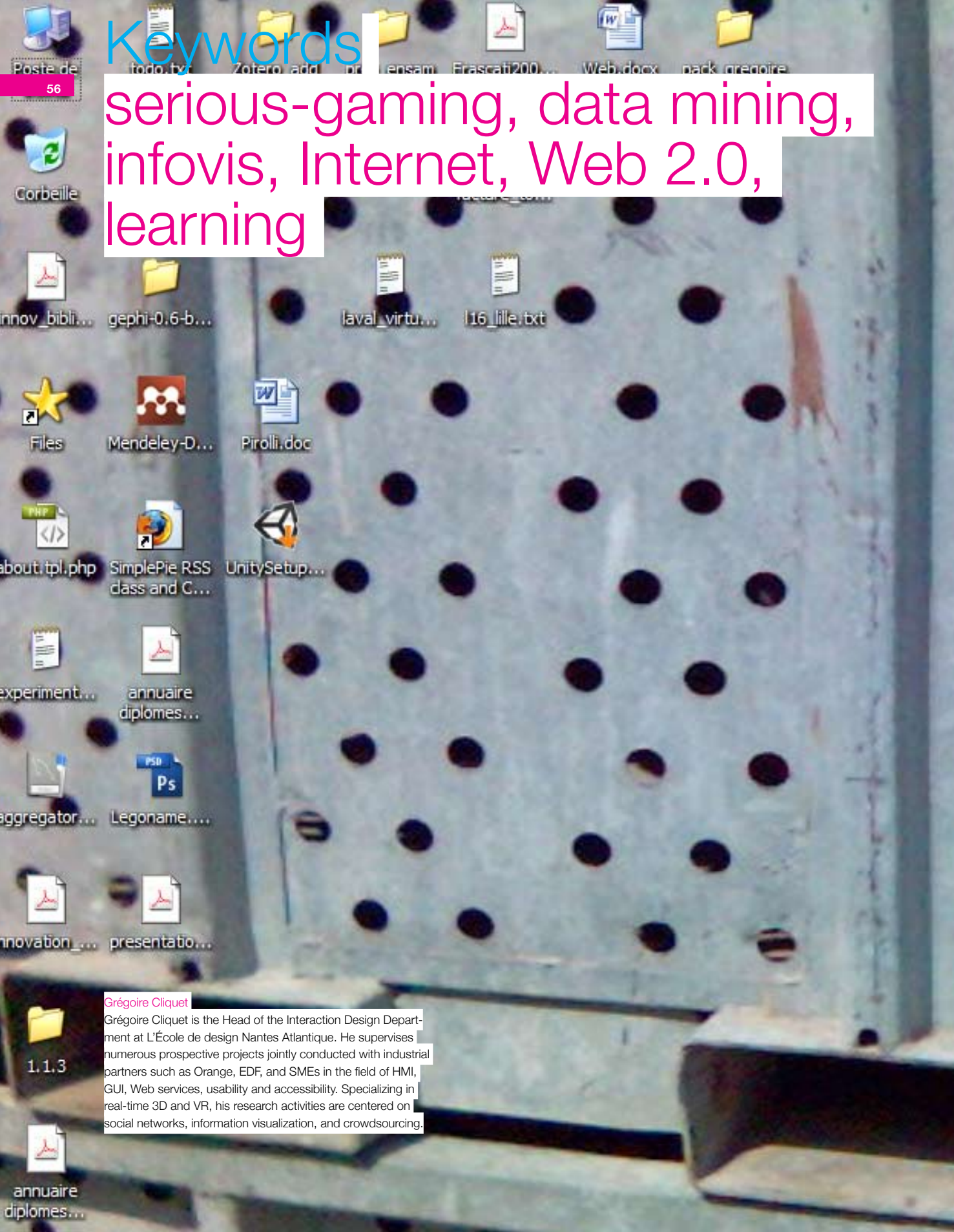
Keywords
serious-gaming, data mining, infovis, Internet, Web 2.0, learning



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datatainment

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Abstract

This article aims to define a new field of studies and experimentation at the cross-roads between the worlds of gaming and online digital data: "datatainment."

"Datatainment" is a portm[illegible] refers to a new way of representing

Image 1 Dataquarium / l'École de design Nantes Atlantique / 2007

digital data related to the activities of individuals within the information world. Through this new concept we intend to implement the dynamic transposition of a community's information-related activities to video and amusement-oriented environments.

Definitions

data: In this paper "data" is to be understood as part of a basic material malleable at will that can be shaped just like clay into a form or as a volume laden with meaning and emotion. Data can either be presented in a quite elementary way: in binary, hexadecimal, decimal patterns… like digital data produced for statistic purposes ("log" files on web servers, for instance), or they can be aggregated in a meaningful (informative) way, which means considered as a message/message fragment (a comment on a blog, for instance).

(enter)tainment: Since playing games is said to be very significant in the evolution of species and especially in the evolution of mammals,[1] we should overstep the usually mostly derogatory views of game-playing and rather strive to see it in a different, anthropological light by focusing on its cultural and teaching-oriented dimensions.[2] Reaching far beyond all competitive or collaborative logic, games are metaphors of the real world in that they transpose formal, customary behaviors and enable individuals to increase their creativity while fostering their social skills and, in the greater picture, contributing to the very development of civilization.[3] As Chris Crawford[4] says, the ability of games to bring together distinct entities makes them key elements of interaction design. Game playing promotes dialogues between human beings and machines as shown by Apple's tremendous success: "The Macintosh is just a toy." As a new "hyper-social" society composed of "digital natives" is currently surfacing, games appear as a great opportunity to transcribe the behaviors and actions of individuals within an informational environment (cyberspace).

Datatainment stems from experiments conducted in the

1 Karl Groos, *The Psychology of Animal Play* (Kessinger Publishing, 2005).

2 Johan H. Huizinga, *Homo Ludens: A Study of the Play-Element in Culture* (Routledge, 1998).

3 Roger Caillois, *Les jeux et les hommes*, Ed. rev. et augm. (Gallimard, 1992).

4 Chris Crawford, *The Art of Interactive Design: A Euphonious and Illuminating Guide to Building Successful Software* (No Starch Press, US, 2002)

field of mapping whereby it first and foremost aims at representing the digital territory. To do so it borrows from graphic semiology[5] and transcends the founding principles of information mapping;[6] in this case variables are materialized by dynamic symbols, be they metaphorical, explicit, or personified; maps (the media) – traditionally used to contextualize data or messages – turn into "environments" within which data and messages can evolve easily. But the true specificity of datatainment lies in its implementing interaction modes that break free from usual functionality and accessibility requirements so as to enable users to experience situations drawing inspiration from the notion of gameplay.

Context

The birth of the Web 2.0[7] and the subsequent increase of all related online content-oriented applications have brought about a rise in the amount of resources available to Internet users, promoted knowledge-sharing, and woven social relationships out of shared knowledge and opinions. Some thinkers see this phenomenon as the expression of a "collective intelligence."[8] It also appears as a huge field for exploration (data mining). A good example of this is a study conducted by F. Ghitalla,[9] which proved to be strategically effective on the political field. Data mining on French blogs enabled him to predict that the French would say "no" to the European Constitution at the referendum held on May 29th, 2005, whereas most polling agencies announced that the Treaty would be heartily welcomed by the French. In the field of economics, "Crowdsourcing"[10] enables one to observe market trends or the dynamics of competition seen from a user's point of view.[11] In the field of data research the crossbreeding between browser history, correspondence, and Internet user behavior has played a quite significant part in Google's quickly achieved fame.

Datatainment is not meant to create analyzing tools: it is rather a mode of representation helping Internet users grow increasingly aware of their own "cyber-existence," and in so doing, realize that they are constructing a digital identity. Facebook, Myspace, Twitter, Flickr, and many other 2.0 applications contribute to the development (usually unconsciously) of a "virtual you." Rooted in a long-term educational approach, datatainment is a means of facing the crucial need to educate people about the omnipresent information ecosystem that is also on the verge of becoming omniscient.

"Serious" Games

Video games undoubtedly took part in the development of micro-computing whereby they helped the broad public adjust to it. Their success – now going way further than merely fulfilling the need for entertainment[12] – shows how the Internet users of today have embraced video games as cultural values, going as far as making video games into essential 21st Century knowledge acquisition and knowledge transfer tools. Nowadays video games are gradually breaking free from all-too-common heroic fantasy-type quests and growing more mature, becoming "serious games." J. Alvarez[13] defines "serious gaming" as a "Computer application aiming to combine serious aspects such as – this is a non-exhaustive list – teaching, learning, communication and information with amusement-oriented features stemming from video games. This combination – achieved by implementing an "educational

5 "Information semiology" would perhaps be more appropriate, referring to the use of maps to represent information.
6 Jacques Bertin, *Semiology of Graphics* (Univ. Wisconsin P, 1984).
7 Tim O'Reilly, "What Is Web 2.0? Design Patterns and Business Models for the Next Generation of Software," *O'Reilly*, September 30, 2005, http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html. (accessed 3/15/09).
8 Pierre Levy, *L'Intelligence collective : Pour une anthropologie du cyberspace* (La Découverte, 1997).
9 Several business intelligence tools dedicated to exploiting trends prevailing in the Web 2.0. can be found on the RTGI website ("Réseaux, Territoires et Géographie de l'Information") http://rtgi.fr/?p=solutions (accessed 3/15/09).
10 Jeff Howe defines crowdsourcing as "the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call." Crowdsourcing. http://crowdsourcing.typepad.com/ (accessed 3/15/09).
11 An issue I have been researching as part of my Ph.D. thesis, "Web 2.0 and Integration of the Horizontal Innovation Strategy into the Global Innovation Strategy of SMC's."
12 According to R. Caillois "MMORPG" (Massively multiplayer online role-playing games) rank in the "mimicry" category because when "corrupted" (i.e., when the boundaries between game and reality are too blurry) they can be quite harmful and – among other potential consequences – lead to the player's alienation or schizophrenic behavior (cf. table II, p 122).
13 Julian Alvarez, "Du jeu vidéo au Serious Games : Approches culturelle, pragmatique et formelle" (Université TOULOUSE II - Toulouse le Mirail, Université TOULOUSE III - Paul Sabatier, 2007), http://www.jeux-serieux.fr/wp-content/uploads/THESE_SG.pdf. (accessed 3/15/09).

scenario" – endeavors to detach itself from mere entertainment." Serious gaming is a means of transposing contexts, objects, activities, and actual situations to "virtualize" them into playful environments. In this virtual context the user can therefore explore real-life situations as a game. To do so, serious gaming relies on digital realistic models and takes the shape of a simulation device coupled with gameplay, enabling the player to follow an interactive educational process.[14] Thanks to serious gaming, we can play to solve a wide range of complex issues ranging from the individual practice of a foreign language[15] to collective protein folding[16] or to planning, organizing, and rehearsing varied rescue operations.[17]

Datatainment Specificities

The main difference between datatainment and serious gaming lies in their relationship to reality. When I play "Fold It," the game's interface renders behaviors and automatic responses that fully mirror the biochemical phenomena ruling over protein structure. This way, by manipulating a three-dimensional puzzle I get a chance to discover new protein structures that may bear fruit and lead to the production of an actual vaccine. On the other hand, datatainment relies on resources coming from an already immaterial environment; it takes raw material from the web and recontextualizes it into a metaphoric state. Then, datatainment aims to materialize this metaphorical eco-system into a simulated everyday object as an aquarium or via tangible interfaces and communicating products.[18]

The main difference between datatainment and serious gaming lies in their relationship to reality.

14 Jean-Noël Portugal, 2nd European Serious Game Summit (Lyon, France, December 2006)
15 "English Training" or "Dr Kawashima's Advanced Brain Training" on Nintendo DS http://www.nintendo.fr/NOE/fr_FR/games/nds/programme_dentranement_crbral_avanc_du_dr_kawashima_2920.html (accessed 3/15/09).
16 http://fold.it is part of the research effort to find an anti-HIV vaccine.
17 Such as "SWORD": Game developed by MASA Group for firefighter training. (http://www.masa-sci.com/security.htm) (accessed 3/15/09).
18 Check out the "nabaztag" rabbit (http://www.nabaztag.com/fr/index.html) (accessed 3/15/09).

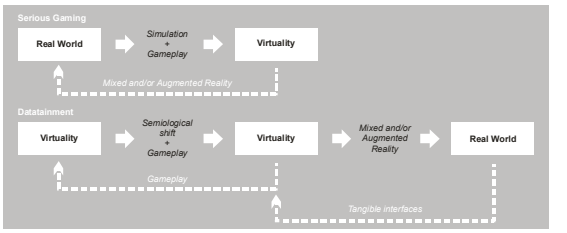

Image 2 Differences between Serious Gaming and datatainment

The sole use of the datatainment application, (over and above the materialization of an "e-reputation") in the universe of social networks, consists of embodying a digital environment, in principle, invisible, but one which translates behaviors or acts in a significant way into our real environment. Datatainment «gives» the general public, through an easily recognizable form, digital databases with the purpose of awareness or prevention.

Thus, we can already envisage a datatainment application in the sustainable development domain, making users aware, in a playful way, of their respective consumption of natural resources (water, electricity, etc.). A virtual avatar, for example, could communicate through its state of vitality, its cautious use or waste of natural resources. This virtual pet, with which one can form an attachment, could closely evoke a determined « ecologically biased » community of consumers who could doubtlessly become more « efficient » through the Datatainment application than through the use of other coercive methods normally adopted (catastrophic documents, political pricing policies, etc.).

Moreover, Datatainment forms part of a process accompanying the arrival of new types of operating system exploitation allowing, up until now, the conception of content production. At the time of Web 2.0, it became necessary to ponder new modes of interaction adapted for contemporary usage. The computer was not originally designed for today's new internet use patterns. Nowadays, the computer's internet connection is mainly used for visualization, access, and content consultation; there was therefore an obligation to broaden the basic principles of direct manipulation alongside these new behaviors via the development of new operating systems. Web 2.0 made it necessary to ponder new modes of interaction adapted for contemporary use; Datatainment will become part of this ongoing development process by accompanying the arrival and subsequent exploitation of new types of operating systems that up until now have focused on the conception of content production. If the WYSIWYG[19] contributed at that time to familiarizing us with printing documents, Datatain-

19 WSIWYG-What You See Is What You Get

Image 3 Dive!

ment extends this notion, by means of « What You See is What you Are »,[20] to bring us closer to digital social environments. The components of the system are not about « exploitation » anymore, but rather about « cohabitation » with the computer and are dedicated to the manipulation of creative content following in the footsteps of Mash Up software – a manipulation capable in its own way of "breeding" the production of new content.

Dataquarium

"Dataquarium"[21] is an experiment conducted in 2007 by two interaction design students as part of the datatainment project.[22] This study was centered on the "Campus"[23] of L'École de design Nantes Atlantique (LEDNA), an intranet centralizing several online services, sustaining the cohesion of all our pedagogical activities: webmail, planning, phonebook, project follow-up, further teaching material, photo gallery, and a public instant messaging application, the "Mégaphone," which is quite popular among our students. The Campus has now become absolutely indispensable and brings together the activities of over 700 students, teachers, and coordinators. It is visited by an average number of 250 users a day.

The dataquarium installation was developed as an exhibition in the entrance hall of LEDNA, in the form of an aquarium. This first experiment aims to help us visualize in real-time the incoming and outgoing data flow from the Campus and to provide a metaphorical virtual representation of its users. The environment (setting and flora) is dynamically generated according to daily statistics relating to the number of users visiting the website of LEDNA,[24] the bandwidth used, and incoming and outgoing e-mails. Users connected to the intranet move about in the shape of three different varieties of fish attributed to three different types of users: students are represented by butterfly fish, professors and coordinators by clown fish, and a hypothetical caretaker – the Managing Director of LEDNA – appears as a Henochius fish.

20 *Time Magazine* Dec. 25, 2006 : Person of the Year: You (http://www.time.com/time/covers/0,16641,20061225,00.html) (accessed 3/15/09).
21 http://datatainment.lecolededesign.com/dataquarium
22 Diane Faidy (http://turing.lecolededesign.com/dfaidy/) and Julien Dumail (http://clickonme.free.fr/)
23 http://campus.lecolededesign.com
24 http://www.lecolededesign.com

The short texts coming from the “Mégaphone” or from the text message area (as far as the on-line version is concerned) gradually crumble to pieces on which this virtual aquatic fauna then feeds.

The fish behave in a randomly autonomous way. Labeled with a text message area, the online version enables users to send information so as to command their avatar to perform such or such action within the aquarium (speed, slow, etc.).

Finally, thanks to a management-console-like interface, users are free to modify their personal data (e-mail, website URL) and to customize the default texture of their fish (bitmap format image). The “W” key is used to display/hide the name of the fish and the “Z” key enables users to shift the camera view angle and zoom on the fish.

Crystal Campus

A second version called “Crystal Campus” is currently in progress. It pertains to a “Crowdsourcing” dynamic[25] aiming to spur students to feed and enhance the resources available to the whole community by contributing personal data. Instead of ranking students according to their school-year or their major (Product, Interaction, or Spatial design), we rather wish to rank them – and sometimes single them out – for their contribution to our digital resources. For instance, we can rank them by using their ability to store bookmarks on our social bookmarking platform and by analyzing their position into our informal social network (Friend of a Friend – FOAF). Crystal Campus should also pave the way to a broader-scoped reflection on new teaching methods born from the network-based environment. A “knowledge-sourcing” process given concrete expression through a carefully thought-out integration of all hypermedia, through the web 2.0’s “social” and “community-based” dimensions, in order to emphasize a horizontal approach to knowledge transfer, as encouraged by Laurent Neyssensas – professor at LEDNA – in an article about “short-distance learning.”[26]

Beyond its technical realization, Crystal Campus constitutes the base of a social and ethical experimentation which is designed to study social consequences to bring together informational spheres with our natural environment. In effect, this version which is more «evolved» could be considered by students as a surveillance tool which could be rejected by a community due to it being different to its predecessor: the Dataquarium. On the other hand, more realistic in the treatment of information and in its re-transcription, it could lead to reuniting and energizing campus life at the heart of the school and favor the bringing together of individuals. In so doing, it can contribute, and therefore energize, collaboration (often claimed but rarely effected), rather than causing competition between individuals. With this in mind, we will propose modes of representation based on «shared» avatars rather than individualized and we will analyze the dynamic results emanating from this collective appropriation in comparison with the well known phenomenon, emblems, and mascots.

We will establish in parallel with Crystal Campus an observation protocol, aimed at gauging the acceptance of Datatainment and adjusting its’ positioning, to define a balance between pragmatic behavior analysis «on line» user behavior and metaphoric and playful representation techniques.

25 Jeff Howe. *Crowdsourcing*. http://crowdsourcing.typepad.com (accessed 3/15/09).

26 Laurent Neyssensas, “Short-distance learning [keeping track of information],” Blog, *Laurent Neyssensas*, June 13, 2008.

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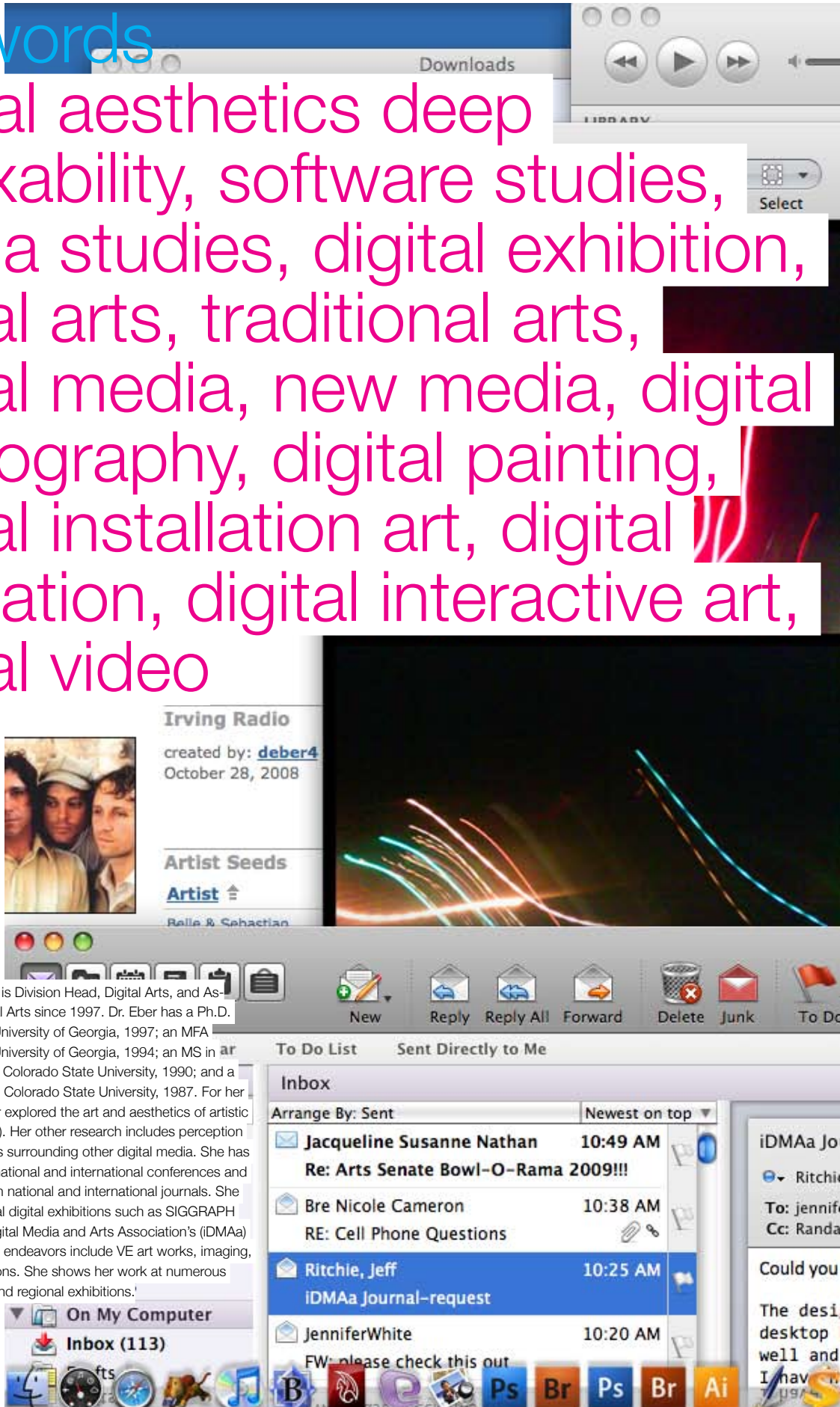
Keywords

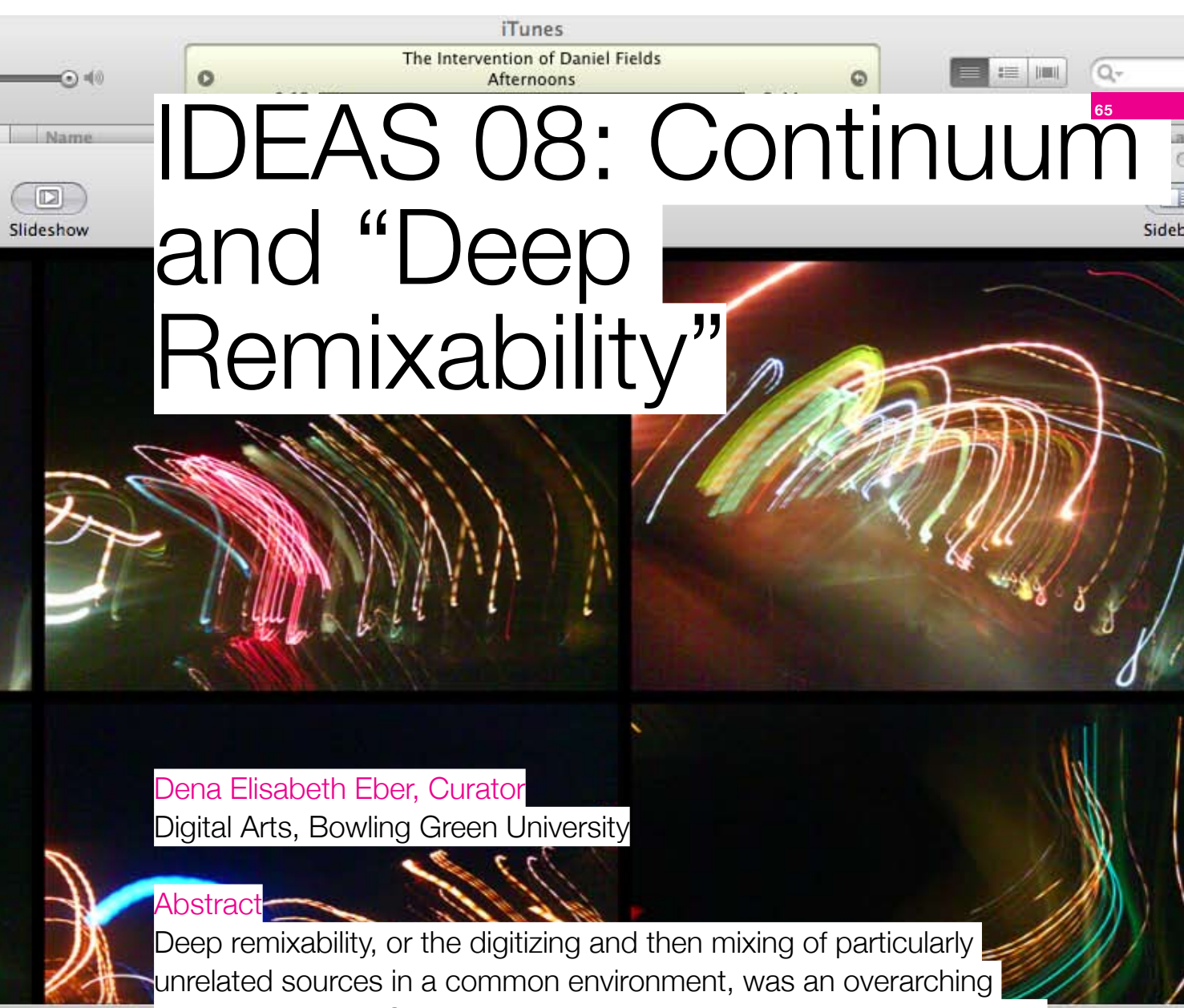
Digital aesthetics deep remixability, software studies, media studies, digital exhibition, digital arts, traditional arts, digital media, new media, digital photography, digital painting, digital installation art, digital animation, digital interactive art, digital video



Dena Elisabeth Eber

Dr. Dena Elisabeth Eber is Division Head, Digital Arts, and Associate Professor, Digital Arts since 1997. Dr. Eber has a Ph.D. in Digital Arts from the University of Georgia, 1997; an MFA in Digital Arts from the University of Georgia, 1994; an MS in Computer Science from Colorado State University, 1990; and a BS in Mathematics from Colorado State University, 1987. For her Ph.D. research, Dr. Eber explored the art and aesthetics of artistic virtual environments (VE). Her other research includes perception and the creative process surrounding other digital media. She has presented this work at national and international conferences and has many publications in national and international journals. She also curates international digital exhibitions such as SIGGRAPH and the International Digital Media and Arts Association's (iDMAa) iDEAs. Dr. Eber's artistic endeavors include VE art works, imaging, and interactive installations. She shows her work at numerous international, national, and regional exhibitions.

IDEAS 08: Continuum and "Deep Remixability"



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Abstract

Deep remixability, or the digitizing and then mixing of particularly unrelated sources in a common environment, was an overarching theme in the IDEAS08 art exhibition. Much of the artworks on display created mixes such as organic and digital, real life and alternative existence, old and new, participants and art, and human experience and visual images in such a way that they revealed unique mappings made possible by a shared digital palette. The remix was deep because the mutual digital denominator facilitated a unique relationship made possible by the tools. This essay applies deep remixability to digital arts and traces the notion through representative works from the exhibition, concluding that this frame will ultimately predict the future of digital arts.

IDEAS08: Continuum: Digital Media Arts Tomorrow Through Visions of Yesterday and Today was an exhibition held in Savannah, GA in November of 2008 that examined how the digital technology of yesterday and today imagined the digital world of tomorrow. Although we cannot know for certain what the coming years will bring, we can examine the contemporary trend of *deep remixability* that was apparent throughout the works on display. *Deep remixability* is a term coined by Lev Manovich that refers to bringing previously unrelated or otherwise non-mixable media together in a common digital environment.[1] This development, I believe, is the frame that exposes the next phase of our artistic relationship with digital media.

Deep remixability is a facet of the emerging field of *software studies*, which Manovich explains is replacing what theorists previously referred to as *media studies.* As interfaces move users further from the underling hardware, software defines the human relationship to media more than direct manipulation of it. Translated in terms of digital arts, there is a need to investigate how the software influences the artist and how the artist, in turn, shapes the software. Although I believe that a tool does not make successful art, I also believe that the tool sways the thinking and creative process of the artist, from cognitive influences to physical possibilities. The mixing of previously unrelated media, such as specific plant forms with geometrical subdivision techniques or raw numeric data with visual images and music samples are examples of how software has facilitated *deep remixing* to form unique artistic and conceptual ideas.

This new kind of integration was evident throughout the works in *IDEAS08: Continuum* and although some of these mixes were possible prior to digital practices; they were not realized in the same way and with the same ease. In some ways it is like writing prior to word processing. Certainly, people wrote great works and did incredible research previous to desktop computers. However, writing and research meant organizing thoughts on note cards and scraps of paper, using a hard copy of a dictionary, and employing exceptional skills in typing and with corrective tape. Now writers can type streams of thought in searchable files filled with typing and grammatical errors. All idiosyncrasies such as these can now be fixed in later iterations of the text no longer hindering the flow of basic creativity. In some cases, this spurs new understanding and different cognitive ways of working. In the end it does not mean we work less to write, but we can now take it in a different direction. Similarly, artists of the past thought about audience interaction and constructed forms of physical and conceptual interactivity, but now artists can engage the participant in new ways, through digital interaction or alternative communities. The new amalgamations in *IDEAS08: Continuum* took the form of many things including the mix of organic with digital, real life with alternative existence, the old with the new, the participant with the art, and the human experience with the visual and aural senses.

Figure 1 *Black Mangrove Series: Explorations in Digital Sculpture* Andrew Scott

Smoke Water Fire (Figure 2), a digital animation by Mark J. Stock, is another example of the natural/technological union as it shows the slow motion of a blob-like shape that is reminiscent of liquid. It is removed from its referential environment, thus forcing the viewer to contemplate the brevity and the ephemeral shape of a moving drop of fluid. The animation further forces viewers to reflect on the relativity of time and its relationship to their lives. Stock takes liquid, the natural element, and reduces it to bits that he reforms into something new.

1 Lev Manovich, *Software Takes Command.* http:// www.softwarestudies.com/softbook 2008. (accessed March 10, 2009).

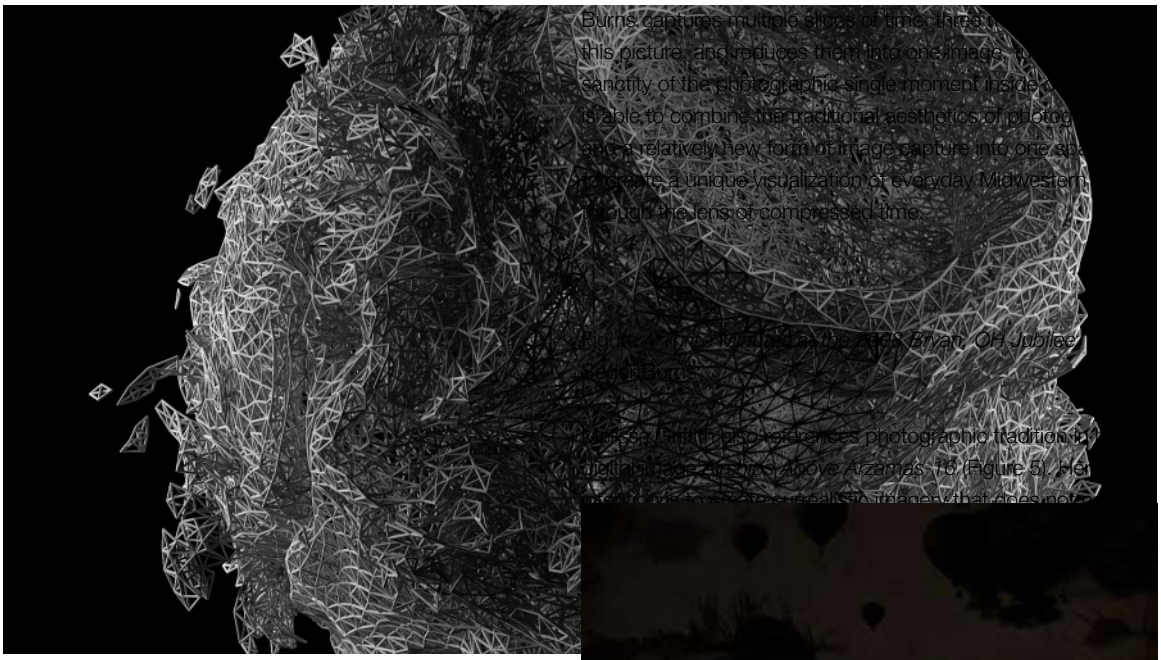


Figure 2 *Smoke Water Fire* Mark J. Stock

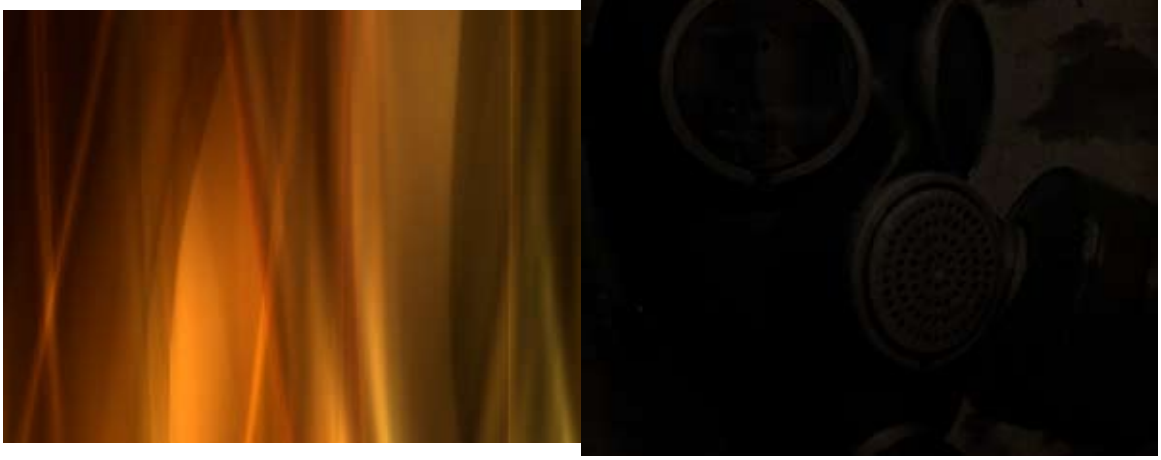


Figure 3 *2007.3* Kenneth Huff

The digital medium is ironically a natural way to bring together the old and the new. This mix within the digital realm forces us to revision the past through the frame of the present and suggests that we think about the future with a similar mapping. Seder Burns' digital image *Three Minutes at the 2008 Bryan, OH Jubilee* (Figure 4) does this by reframing the classic notion of the photographic "decisive moment," or the capturing and embedding of time and truth in film. Using a custom scanner camera,

Figure 5 *Airships Above Arzamas-16* Melissa Griffith

Burton Sears masterfully combines the old with the new in his installation *Professor Sears' Electrophonic Anachroscope* (Figure 6), which is an old fashioned camera-like construct that is built around a contemporary digital core. It records live video and streams it back along with other captured media. The resulting experience is an embodi-

2 William J. Mitchell, The Reconfigured Eye, *Visual Truth in the Post-Photographic Era,* (Cambridge: MIT Press, 1992): 31.

Figure 6 *Professor Sears' Electrophonic Anachroscope* Burton Sears

If we can romanticize about our current world with future digital technology, we can, with the help of digital tools, realize alternate worlds next to our physical one. Jacqui Morie and Anthony and Sandra Fontana use Second Life (SL), which is only one example of new alternative spaces made possible by software and networking, as a vehicle for their work. Some might argue that this is a mix of the real and the virtual in ways that have not been mixed before. Instead, I suggest that the so called virtual is actually just another slice of reality.[3] The digital space provided by SL allows people to build avatars that create real time narratives in a real social and monetary economy. The avatar then goes about living and interacting with others in this space, thus creating a narrative similar to other facets in our lives. Through this interaction and living, the avatars tend to become a physiological extension of one's self. Avatars need to adapt to the social landscape in SL just as people adapt to social landscapes of any environment. Put more succinctly, "The narrative element is reality itself. In Second Life we look at a scene that is more than a metaphor for reality. It is both-reality and metaphor at the same time!"[4] The interaction that happens in SL becomes a real story with real people brought together in new ways.

Both SL works in *iDEAs08* not only show a blend of reality, life, and metaphor, but they represent how art predicts the future. In 1984, William Gibson imagined a world similar to SL in his novel *Neuromancer*, which predates SL by roughly 20 years. Gibson's imagination helped engineers envision possibilities that came into being. Perhaps the art and living of SL envisions a future of further psychological mixing of digital existence and the self. This is already happening as many inhabitants feel that the separation between SL and traditional life experience is often indistinct. This was certainly the feeling of Mark Meadow after he spent two years

Figure 7 *Remembrance and Remain* Jacqui Morie

Anthony and Sandra Fontana take this mix of life a step further with *Avatar Meets Girl* (Figure 8), a machinima animation created in SL. Machinima is an "in-world"[6] animation tool that extends the language of cinema to include films

3 Defense of this suggestion is outside the realm of this paper, but I mention it here because it is key to understanding what is being remixed. They are mixing different forms of reality to bring to fruition a new kind of experience that is just as bona fide as our physical world, but represented in a new and unique way.

4 Stephen Doesinger, *Space Between People: How the Virtual Changes Physical Architecture,* (Munich: Prestel, 2008): 13.

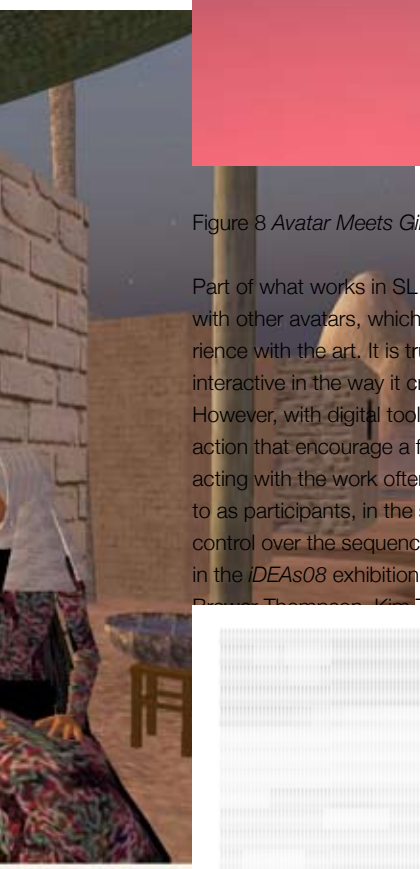
5 Mark Stephen Meadows, *I, Avatar: The Culture and Consequences of Having a Second Life*, (Berkley: New Riders, 2008): 8.

6 By "in-world" I mean a something available only while using Second Life.

Figure 8 *Avatar Meets Girl* Anthony and Sandra Fontana

Figure 10 *Meros* Dylan Moore

Part of what works in SL is that it requires users to interact with other avatars, which helps facilitate an aesthetic experience with the art. It is true that a dimension of all art is interactive in the way it creates a dialogue with the viewer. However, with digital tools artists create new forms of interaction that encourage a fresh way to think about art. Interacting with the work often puts viewers, or better referred to as participants, in the shoes of the artist or gives them control over the sequence of events. A number of works in the *iDEAs08* exhibition did this, including pieces by Cara



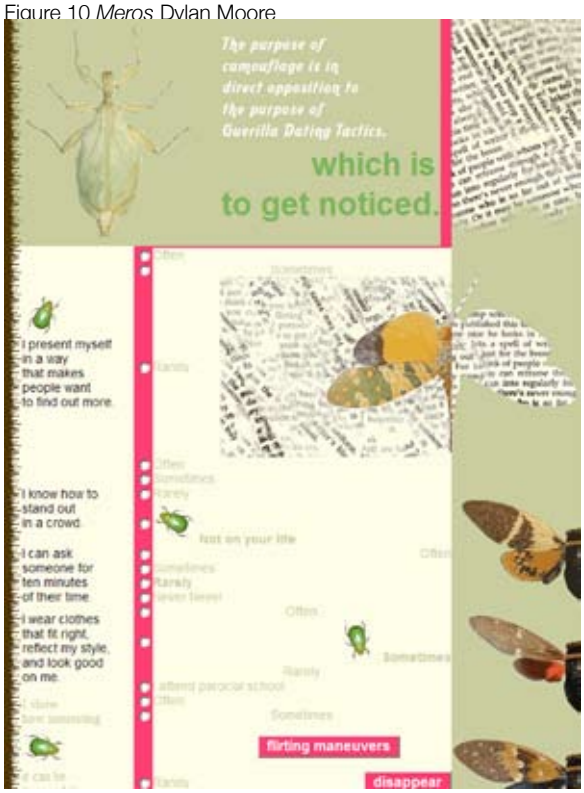
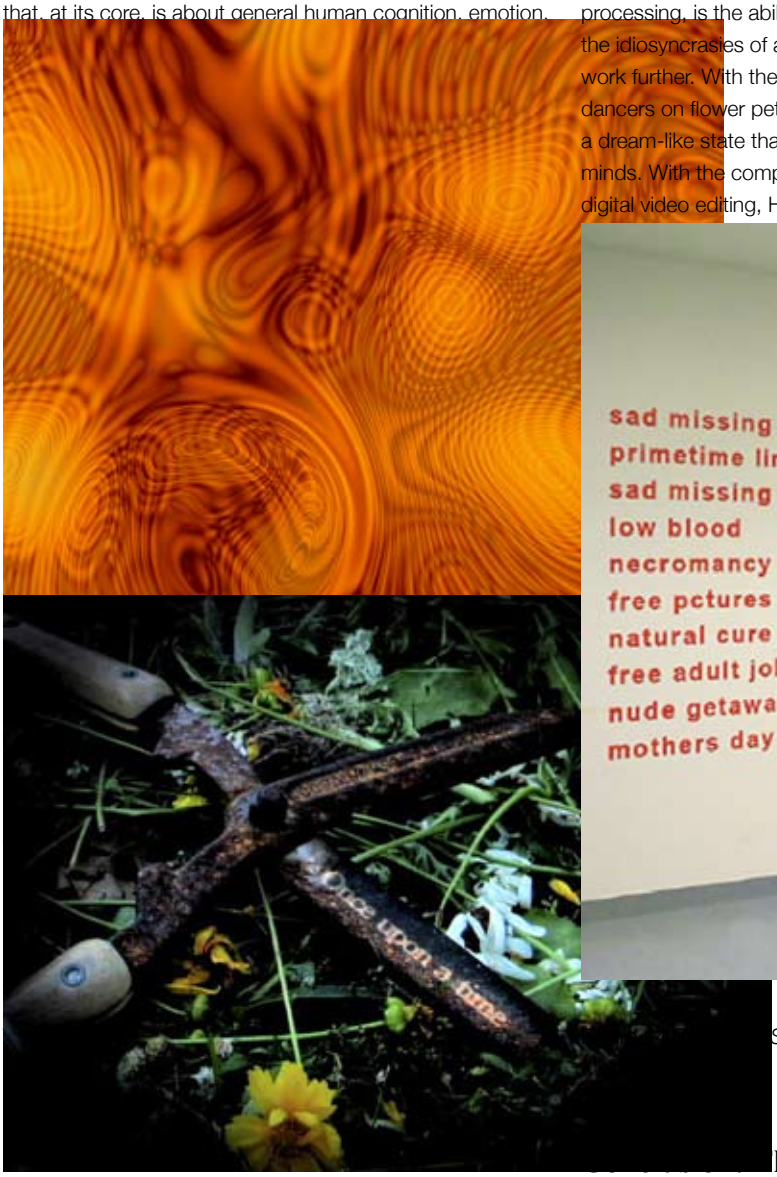


Figure 9 *agnesMartin()* Cara Brewer Thompson

Figure 11 *Camouflage Mentality Trap*

There are many other mixes that are mashed in digital space, more numerous than I can list. One potpourri category nets many of the remaining works in the exhibition that, at its core, is about general human cognition, emotion,



kinds of mixing not only easier, but also doable by more people. Although there are some functions unique to digital video editing, the most important contribution, as with word processing, is the ability for artists to free themselves from the idiosyncrasies of analog editing so they can take their work further. With these tools, Hardacker puts Balinese dancers on flower petals and singers on a lily, visualizing a dream-like state that she suggests inhabits most of our minds. With the comparatively instantaneous process of digital video editing, Hardacker mixes and visualizes such

Series Suzie Webster

Figure 13 *The Nightgardener* Jennifer Hardacker

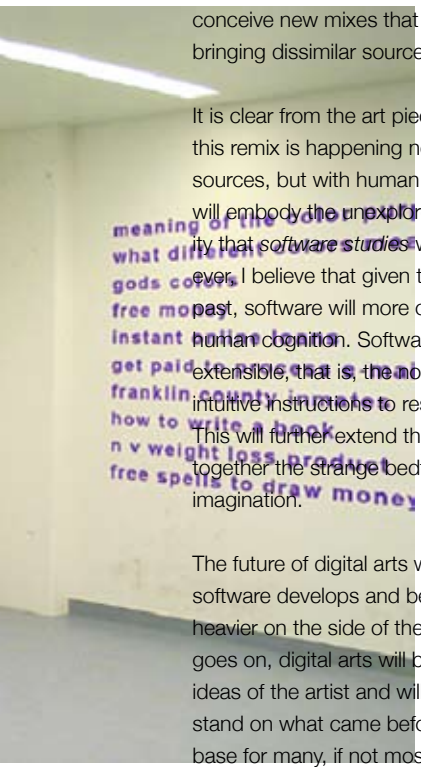
he Resulting Stew

Film editing has existed since the beginning of film, but the kind of digital splicing that Hardacker uses makes certain

iDEAs08: Continuum was an exhibition that embraced the spirit of *deep remixability* and ultimately exposed premonitions of the future of digital arts through work that referenced the past and the present. As digital tools have matured and new media have become a series of usable interfaces (software) that speak the language of the user,

7 Dena Eber, ed., catalog for iDEAs08*: Continuum: Digital Media Arts Tomorrow Through Visions of Yesterday and Today,* (Lulu Press, 2008): 6.

the mix of many disciplines have been reduced to binary bits and have surfaced to become "deeply" remixed to the point of blurring boundaries. Traub and Lipkin suggested relatively early on that truly creative individuals "are integrated in that their creativity functions as an organic part of society, and they act to connect for the common good. They are integrators in their ability to negotiate the disparate fields of human knowledge and bring them together in previously unimagined ways. In so doing, they enable others to further their imaginations."[8] Therefore, artists conceive new mixes that model and suggest strategies for bringing dissimilar sources together in new ways.



It is clear from the art pieces in *iDEAs08: Continuum* that this remix is happening now and not only with diverse sources, but with human cognition. Digital art of the future will embody the unexplored crevices of human creativity that *software studies* will continue to disclose. However, I believe that given the evolution of digital arts of the past, software will more closely reflect what is now natural human cognition. Software continues to become more extensible, that is, the novice user can write scripts or intuitive instructions to reshape what the software does. This will further extend the ability of creative artists to bring together the strange bedfellows conjured up through their imagination.

The future of digital arts will continue this mixing and, as software develops and becomes more extensible, weigh heavier on the side of the artist influencing the tool. As time goes on, digital arts will be more in support of the specific ideas of the artist and will afford new ways of thinking that stand on what came before. The digital platform will be a base for many, if not most, art forms as otherwise divergent sources are reduced to common binary bits.

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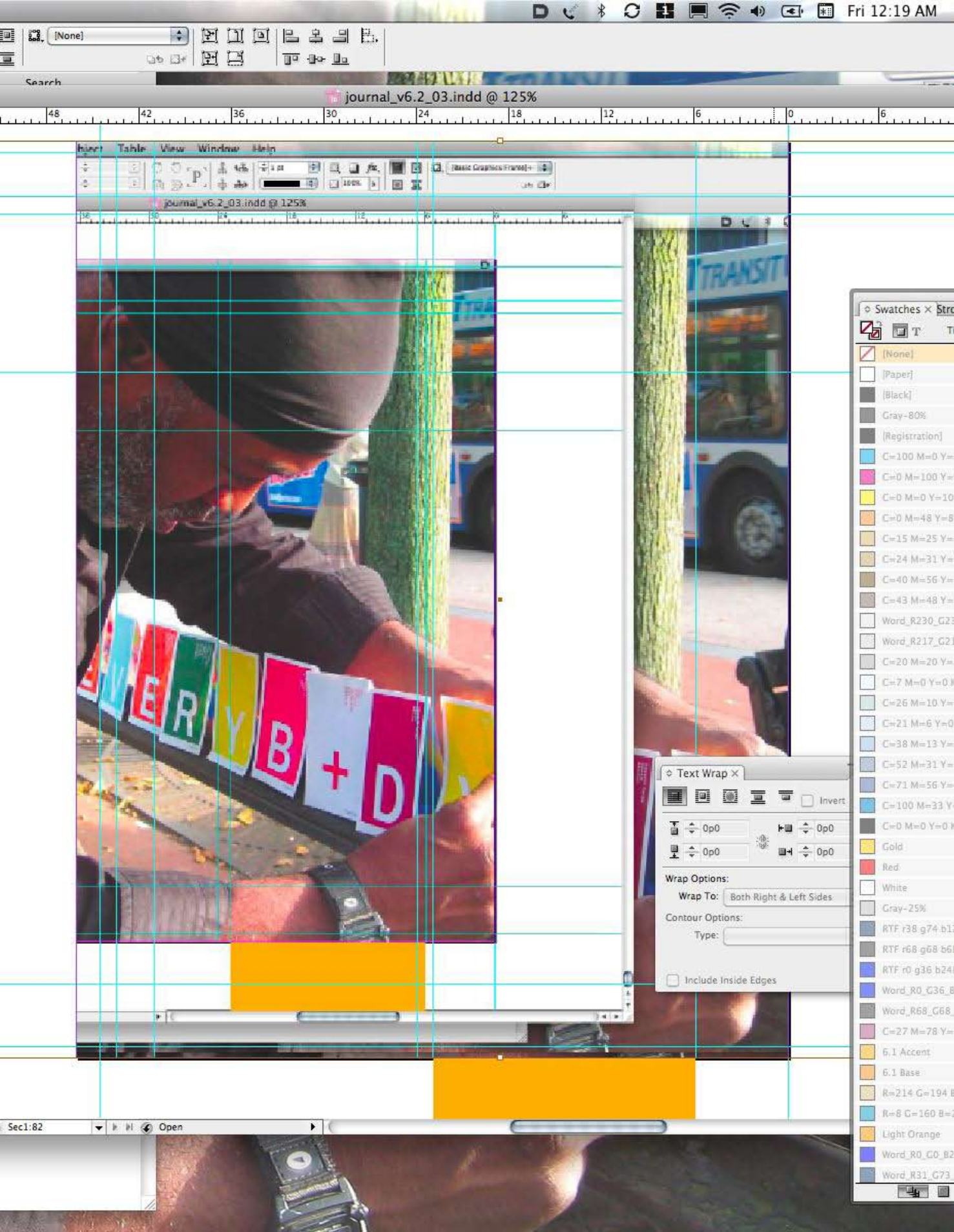
8 Charles Traub and Jonathan Lipkin, "If We are Digital: Crossing the Boundaries," *Leonardo 31* (1998): 363-366.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