HUMAN TECHNOLOGY

An Interdisciplinary Journal on Humans in ICT Environments

Contents

From the Editor in Chief

MAKING IT POSSIBLE

Pertti Saariluoma
Cognitive Science, Department of Computer Science and Information Systems
University of Jyväskylä, Finland

In a world not so long ago, it was a common belief that humanism and technology belonged to different worlds. Such thinking was embodied in the well-known book *The two cultures and the scientific revolution,* by C. P. Snow (1959). In his terms, these two disciplines are distinct and do not relate much to each other. In the nearly half century since Snow penned his treatise, however, more and more people are coming to see that the discourses about and within the technology fields and the humanistic fields are not separated by such high a wall—or even a wall at all. In the past decade, abundant research has pointed to the value—indeed, the need—for technology to be continually influenced by humanistic ideals. As a result, technologies of diverse purposes are slowly becoming more human-centered and humans are finding new ways to view and use technology.

Snow (1959) also noted that the most fruitful outcome for people arises from the clashes between the technologist perspective and the humanist perspective. One might consider this outcome creativity.

In the dictionary sense, creativity is the ability to transcend traditional patterns, relationships, rules, and assumptions to create meaningful (and useful) new ideas, interpretations, patterns, relationships, and methods. In the humanistic sense, creativity can lead to new forms of emotional expression, new perspectives on the human condition, new interrelatedness among peoples and with the objects and concepts that surround us. In the technological sense, creativity can lead to new methods of expression, new gadgets that facilitate or alter thinking and behaving, and new patterns of social interaction. In a sense, the meeting of humanism and technology on an equal plane results in the opening of creative possibilities that are limited only by the human imagination.

Humans have always used technologies to express their creativity, and some fields, such as art and entertainment, have been quite adept at adapting current technologies to fit their expressive needs. However, the limited access to items such as printing presses, celluloid film, gallery space, and audio broadcasting equipment necessarily had narrowed the avenues that individuals had for distributing their creative outputs. They had to rely on others for access (and approval) in order to have their products or thoughts dispersed to others.

With the dawn of the Internet a bit more than a decade ago, and its exponential growth, the number of distribution channels has opened for the average person; various new technologies provide the access for just about anyone to express himself or herself, with little censure or direction from the traditional distribution gatekeepers. As long as one has constructed the necessary preconditions for creativity (the hardware, software, and connectivity needed for access to the Internet, access to raw materials—video, digital animation tools, etc.—and access to editing tools, to name a few), the possibilities are almost limitless.

Certainly creative expression does not necessarily equal creativity. Looking at the thousands of new postings each day to YouTube demonstrates this fact. However, millions of people go to YouTube and similar distribution services regularly because they are seeking entertainment, or perhaps inspiration. In many ways, watching the poor production qualities of most YouTube videos is like watching the early days of the cinema, much of which has been forgotten. But the creative talents of those early cinematic years—the Buster Keatons and the Charlie Chaplins—were easy to identify and their productions have survived the test of time. It would not be surprising, then, that the works of the Keatons and Chaplins of the 21st century—actors and producers from around the world with imaginative talent and innovative minds—are available now somewhere on the Internet, amid the millions of miscellaneous videos of newsy events, family happenings, shameless self-promotions, and pirated broadcasts. But the truly creative gems, unlike the movie studio distributions in past decades, are available for anyone to seek and see, if you have access to the technology.

The new reality in distribution exists not only for videos but also for myriad other creative outputs, such as music, writing, artwork, and philosophical thought. Digital libraries and downloadable music have become a common part of ICT world (e.g. Jones & Jones, 2006; Witten, 2006), with millions of people turning to the Internet as their first source of information and entertainment. Indeed, as the technologies fuel the creative expression of potentially billions of people around the world, these same technologies fuel the search for personal visions of what constitutes entertainment—and so these new technologies provide a space for the meeting of the entertaining and the entertained.

Certainly this unprecedented era of personal freedom of expression and access raises social concern and, at times, animated discussion regarding issues such as personal privacy, child protection, and intellectual property rights, to name a few. Meanwhile, various fields engage in the never-ending debate regarding what is art, what is creativity or innovation, and who decides such matters. And amid this all, the creation and distribution of individuals' personal expression continues. It is clear that technological advances, enabled by the humanistic philosophies, have laid the foundation for distribution of creative expression (as well as a lot of junk) at levels unmatched in human history. What does this mean for societies, for individual creativity, for future forms of creative expression?

We can see that, in the last 50 years, the discourses about technology and humanism—those two disciplines explicitly, but certainly among other scientific fields as well—has gradually melded into a new discourse, new ways of thinking and imagining. It challenges the scholars in these fields to different perspectives, and to the evolving discourses about and definitions of their fields, and more closely tied the research with human implementation. It makes room for revolutionary concepts and activities—some of which can't even be imagined today. But most importantly, this interdisciplinary interaction between sciences—between emphasis on technology and emphasis on humanity—makes possible creativity on

many levels and for many people. And, in the end, the ideals of humanism—that is, emphasis on human values and perhaps a deeper existence—are the winners.

REFERENCES

Jones, J., & Jones, M. (2006). Digital libraries for the developing world. *Interactions*, *8*, 24–27.

Snow, C. P. (1959). *The two cultures and the scientific revolution*. Cambridge, UK: Cambridge University Press.

Whitten, I. H. (2006). Digital libraries for developing world. *Interactions*, *8*, 20–21.

All correspondence should be addressed to:
Pertti Saariluoma
University of Jyväskylä
Cognitive Science, Department of Computer Science and Information Systems
P.O. Box 35
FIN-40014 University of Jyväskylä, FINLAND
psa@it.jyu.fi

Guest Editors' Introduction

UNTITLED: EMERGING CULTURAL FORMS IN THE DIGITAL AGE

Mark Blythe
Department of Computer Science
University of York
York, UK

Ann Light
Interaction Media and
Communication Group
Department of Computer Science
Queen Mary, University of London, UK

Shaleph O'Neill
Interaction Design Lab
School of Computing/School of Design
University of Dundee, UK

The age of mechanical reproduction had profound effects on the creation, distribution, and perception of art and other cultural forms (Benjamin, 1992). As the age of digital reproduction progresses, change is becoming equally, if not more, radical. The speed and scale of technological development presents a series of complex challenges for research. This has become evident in human-computer interaction (HCI), a field of study that emerged from "man–machine studies" (Dix, Finlay, Abowd, & Beale, 1998). As well as acknowledging the existence of women, the new title reflected the shift from the mechanical to the digital age; but, in the last 5 years, there have been such major changes in the study of HCI that this title now seems dated. When computers were largely confined to the workplace, it was clear that interacting with them was a specialized activity that necessitated study. Computing technology is now a part of the way we cook, clean, work, communicate, and play; it is, as the title of this journal declares, a human technology. HCI as a title seems at once too narrow and too broad. It includes interaction with microwaves, dishwashers, and credit cards but also the creation of image, music, and text. Emerging technologies offer new possibilities for the creation and delivery of artworks, new modes of operation within artistic communities, alternatives to the traditional view of galleries, and new means of appreciating older cultural forms.

Culture and creativity are, of course, inextricably tied to technological developments. The rock paintings of the Stone Age would not have been possible without tools, like charcoal, for

making them. The development of oil paint and perspective were as crucial to Renaissance painting as patronage (Berger, 2001). Literary historians note that the existence of the novel was dependent not only on the invention of the Gutenberg press but also the development of a literate populace with enough leisure time and money to form an audience. The new cultural forms of the 20th century were based entirely on technological developments. The reproduction of sound led from Edison's inauspicious recordings to the revolution in popular culture epitomized by the Beatles. The reproduction of images led to cultural forms so successful that it was, and still is, feared that film and television may eclipse earlier technologies like the printed word. The technological changes we are currently witnessing are not without precedent, but human lives have not been changed so fast since the industrial revolution.

New interactive technologies have colonized most, if not all, of our cultural practices within just 20 years. From the development of on-line galleries, to on-line gaming communities, to Web sites that allow us to share music or photographs with our friends and family, we are seeing new forms of expression and a subtle change in our expectation of what is possible. Access to a computer and the Internet equip people not only with the means of production but also distribution. Social networking sites allow users to post blogs, photos, MP3s, and videos. Membership at the social networking site MySpace has risen from nil to 47.3 million in the 2 years since its inception to the time of writing (Koblum, 2006). YouTube is currently even more popular and supports home videos and films appropriated from other media like VHS or TV broadcast. This, without mentioning the vast on-line archives of digital art per se, indicates the kind of far reaching change that technology is making at the beginning of the 21st century. In this special issue, we have tried to look at the new trends in art and design in terms of three intersecting perspectives: culture, creativity, and technology itself.

CULTURE

Culture has been described as one of the two or three most complex words in the English language (Williams, 1988). It has been defined as narrowly as a collection of stories and as widely as the sum of lived experience. Cultural studies is increasingly taught as a field of study in universities and, perhaps unsurprisingly, it is a tangled, multiperspectival, and contentious discipline. However, there are two methodological traditions within it that are increasingly relevant to HCI: ethnography and semiotics. The first is relatively well known and widely used; the second is less well known but increasingly recognized as important.

Ethnographic methods were principally developed in the field of anthropology where (typically) Western field workers studied nonWestern societies. In the early 1960s, pioneers in the nascent field of cultural studies began to turn these analytic tools onto Western society itself. A strong tradition arose in the study of subgroups and subcultures, such as street corner kids, working class school children, and bikers (Willis, 2000). These studies focused on the ways in which participants themselves made sense of their everyday experiences. The problems that HCI attempts to address are intimately linked to the minutiae of everyday life and it is perhaps for this reason that the work of ethnomethodologists such as Garfinkel and Sacks became influential in the domain (Lynch, 2006). Many of the user studies in HCI draw on

5

ethnographic traditions and one of the papers in this collection (Mounajjed, Peng, & Walker, this issue) describes the uses of ethnography in the development of an interactive artwork.

Methods of semiotic analysis were largely drawn from literary theory, building on the insights of Saussure and Peirce about the relation of signs to meaning (Eagleton, 2003). In the early 1960s, literary critics such as Roland Barthes turned their attention from high to low culture and read the texts to be found at large in the world. The same rigor and attention to detail that had been applied to the novels of Balzac were applied to the interpretation of such cultural products as a wrestling match and a spaghetti advertisement (Barthes, 1993). Barthes analyzed not only what the representation denoted but also what it connoted. For instance, the red, white and green in an advertisement for spaghetti connotes Italy though the pasta may be made in America (Barthes, 1993). There is a small but growing literature in HCI that draws on semiotic work to consider the denotative meanings implicit in designs (e.g. Andersen, 2001; De Souza, 2005; Light, 2001; Bardzell, this issue). Semiotic analyses of cultural artifacts such as Web sites or authoring tools lead to very different insights to those gained through traditional usability tests. Increasingly HCI practitioners are turning to other forms of analysis drawn from the wider humanities (Wright & Finlay, 2003).

CREATIVITY

Creativity is also a highly contested term. In 2001, Greene undertook an analysis of the previous 5 years of psychology literature on creativity and produced an inventory that included 42 models in seven broad groups. Greene (2001) criticizes the lack of self-conscious application of creation process models that he found, arguing that none of the famous design colleges in the world teach creativity dynamics as such. Clearly, an understanding of process is not a prerequisite to engaging in it.

For our purposes here, we can make a crude distinction between theories of personal creativity and of culture-altering creativity. Other dimensions include where creativity is situated: from regarding it as an emergent property of interacting environmental factors of which human agency is only one, to the trait models that attribute it to personal qualities in the individual. A Romantic notion of design continues to pervade much ostensibly post-modern technological thinking (Coyne, 2001), despite competing narratives based in practice.

Explanatory theories differ in their level of emphasis, in terms of what is required cognitively, socially, and politically to support the creative process. And more subtly, some acknowledge that one can be creative in the choice of methods, tools, and materials as well as in what one produces, and then can trace the relationship between process and outcome.

Of course, the meaning of creative processes shifts according to a society's priorities. Creativity is associated with practical novelty and the process of innovation in industrialized societies, which prize the original and the authentic. Cultures that are primarily employing hand tools and striving for consistency of form and representation may value dexterity with materials more highly than twists of imagination. The transition from paintbrushes and cellos to digital tools alters our sense of what creativity is by changing our relationship with production and dissemination. As mechanical reproduction has given way to digital reproduction, we see an evolution from practices concerned with differentiating similar products to those that manage the identity of identical ones. If two pieces of code are

identical in a way that two physical objects never will be, and there is no degradation in making copies, then what does this mean for the act of creation? Intellectual property, and the commercial values that accompany it, attempt to constrain what constitutes creativity, be that in the field of music or digital art. Simultaneously, sampling (the "borrowing" of parts of others' work for reuse in another form) and mashing (building applications that combine content from more than one source into an integrated experience) become fresh forms of expression that reflect the new reproducibility.

TECHNOLOGY

More than just the tools we use, technologies are components in the cultural context of production, reproduction, and mediation. Ranges of new skills are now at the fingertips of the technology-savvy generations, where once they were the domain of specialist engineers and programmers. Artists are learning electronics, programmers use graphical interfaces, and designers are learning how to code. The computer hacker, so feared in the 1980s, has almost been reinvented as a creative and invigorating figure in the mold of the Duchampian trickster, appropriating and repurposing technologies from everyday surroundings to solve local problems or for amusement. Communities are emerging that thrive on such practices.

A number of different theorists have attempted to identify the characteristics of these new technologized media forms. Many of their ideas are similar, but few of them offer terminology that provides a clear definition of what the fundamental features of interactive media are. Largely, this is because there are wide ranges of interactive media types that do not always combine the same characteristics.

Paul (2003) classifies a number of characteristics of the new medium; in particular, she notes that its features are recombinant, interactive, participatory, dynamic, and customizable. Packer and Jordan (2001) also provide a categorization of the characteristics of multimedia. They include: integration, interactivity, hypermedia, immersion, and narrative in their definitions. Similarly, Manovich (2001) provides another list of characteristics, taking care to separate some of the differences between old and interactive media. Essentially, Manovich's interactive media characteristics are numerical representation, modularity, automation, variability, and transcoding.

While there are many different kinds of terminology used to describe new mediating technologies, it is clear that many of them have overlapping descriptions. However, the diversity and rapidly changing evolution and appropriation of technology ensures that any attempts to pinpoint its characteristics are immediately challenged as new trends emerge.

LEONARDO NET AND THIS SPECIAL ISSUE

The origins of this special issue lie in the discussions that have surrounded the workshops and events of the Leonardo Net[1] over the last 2 years. Emerging from a concern within HCI to engage with an increasingly technologized society, Leonardo Net has been building a radically interdisciplinary research network to explore issues of culture, creativity, and interactive technologies. Concerned with the interface between arts, technology, and

interaction design, the network draws on researchers from both sides of the arts-science divide, aiming to develop an understanding of how new interactive technologies are changing our cultural and creative practices.

This special issue brings together five articles that reflect the rich diversity of work that addresses emerging cultural forms. Before moving on to describe these contributions in detail, it is important to acknowledge the challenge of researching and writing in this highly interdisciplinary space. Cultural theory has a fundamentally different validation system from the empiricism of HCI and yet the two meet in discussing the adoption and use of new digital forms. The emphasis on practice in design research brings a third set of values to bear. Each author, in contributing to this issue, has had to meet the needs of the diverse communities of their readers. Design cannot exist without diagnosis and evaluation; theory cannot stand without some practice to apply it to; and analysis must acknowledge its philosophical underpinnings. So the work reported here is spread among fields, drawing on methods and theory from a variety of disciplines, and, we believe, is the stronger and more interesting for it.

The Papers

Jeffrey Bardzell offers a concise theoretical overview of creativity from three very different perspectives: HCI, poststructuralism, and technological determinism. Not only does Bardzell illustrate semiotic theory, his novel examples serve as an introductory course to must-see Internet viral videos. This paper considers new forms of technologically enabled creativity from *machinima,* where game players can use their game engines to script short films, to *mashups,* where users splice together found sound and video to make something new. Bardzell makes a convincing argument for a semiotic analysis of authoring tools, arguing that aspects of software functionality, such as ease of use and visibility, determine the most popular forms of production.

Russell Beale offers three examples of ambient art that attempt to convey information creatively. He describes the design and implementation of three systems: a news montage, a weather picture, and an activity Mondrian. The first two represent information derived from news and weather broadcasts with pictures from public photo collections; the last represents activity information on people moving through a building in abstract forms inspired by the paintings of Mondrian. Each of the pieces is evaluated and Beale reflects on the challenges still to be met when conveying information through ambient art.

Sally Pryor is an artist who has produced two multimedia art pieces inspired by the philosophical approach to language known as integrationism. Her article describes how she applied this perspective to her own practice to create artworks that are both exemplars of the theory and a playful exploration of meaning-making. She is inspired by the work of Roy Harris, emeritus professor of general linguistics in the University of Oxford[2], who explores writing as both a communication mechanism and a spatial phenomenon that is qualitatively different from speech. Her fascination with this work manifests in a use of scripts and other images blended to become dynamic signs. She links the creation of meaning with the movement of forming letters using interactive rollovers in her designs. The two works she describes, *Postcard From Tunis* and *Postcards From Writing,* are set in the context of her journey as an artist and her encounter with poststructural theory.

Mounajjed, Peng, and Walker provide an example of how ethnographic procedures can be coupled with the artistic practice of making installation artworks. The paper presents ideas on how to go about using ethnographic techniques and interactive interventions as a means to explore user interactions with technologically embedded spaces. Based on case studies performed or observed by the authors, the main focus of the paper is on the combination of artistic intervention and ethnographic study. They conclude that not only can artistic interventions generate interesting behaviors for ethnographic study but that the results of that study can be used to improve the next iteration of the artwork. Mounajjed et al. thus provide a compelling example of how creative and cultural practices can engage with and be informed by a research perspective used quite widely in disciplines such as HCI.

Katri Halonen's paper is an exploration of the organizational structure and motivation behind membership of the open source artist groups that took part in the PixelACHE 2005 festival. The paper is an analysis of how open source ideology is influencing the work of artists working with digital media, focusing on a set of interviews conducted with participants of the festival. The study presents a comparison between conventional arts practice, open source-influenced practice, and how practitioners fund their work and projects in relation to this. The author proposes the idea that there are a number of stakeholders involved in this kind of artistic community and proceeds to outline how they relate to one another, highlighting the different roles that emerge. Up until now, this area of arts practice has received little academic attention. For this reason this paper is highly relevant to the concerns of this special issue, concentrating on how emerging open source technology models operate within arts practice.

"Untitled"

New cultural forms do not appear fully formed. Their emergence is usually gradual and those who witness the process may not be sure how to talk about it. Peter Bogdanovich refers to over 250 terms for what we now call "movies," including "actorgraph," "reeltaux," and "narrative toned pictures" (Welles & Bogdanovich, 1998, p. 23). Like so many works of contemporary art, this introduction is "untitled." This is not quite the same as being untitled; an untitled introduction would be called "introduction." Similarly, a work of art that was actually untitled would not be sited next to a small white piece of card announcing itself as such. In a gallery the "untitled" title makes the claim: This is art. Such claims have been necessary ever since Duchamp exhibited a urinal, in what John Berger (2001) describes as a last and failed attempt to create a work of art that was not immediately and inescapably also a commodity.

As previously noted, digital reproduction presents a radical challenge to the notion of intellectual property and the ownership of new cultural forms. Not only are new cultural artifacts emerging in response to the digital age, so too are new forms of discursive practice: legal, professional, and academic. The "untitled" title here, then, refers not only to emerging types of cultural artifact but also changing practice within research disciplines.

We hope to stimulate discussion by presenting the work described in these papers and so encourage the articulation and appraisal of new forms. The language of practice is, of course, a factor in determining how a form develops and, in turn, provides the means to discuss what these developments mean. In this sense, language is wholly embedded in the culture of creation. Some of the terms that the authors use here, whether machinima or informative art,

may one day seem as strange as "actorgraph." As new forms emerge, new vocabularies must also develop. We hope that this special issue is a step towards a critical discourse of computing culture, creativity, and technology.

───────────

ENDNOTES

1. For information on Leonardo-Net, see www.leonardonet.org
2. Additional information on Roy Harris can be found at http://www.royharrisonline.com

REFERENCES

Andersen, P. B. (2001). What semiotics can and cannot do for HCI. *Knowledge-Based Systems, 14*, 419–424.

Bardzell, J. (2007). Creativity in amateur multimedia: Popular culture, critical theory, and HCI. *Human Technology*, *3*, 11–33.

Barthes, R. (1993). *Mythologies*. London: Vintage.

Beale, R. (2007). Ambient art: Creative information representation. *Human Technology*, *3*, 34–53.

Benjamin, W. (1992). *Illuminations*. London, Fontana Press.

Berger J. (2001). Art and property now. In G. Dyer (Ed.), *Selected Essays* (103–107). London: Bloomsbury Publishing.

Coyne, R. (2001). *Technoromanticism: Digital narrative, holism and the romance of the real*. Cambridge, MA, USA: MIT Press.

De Souza, C. (2005). *The semiotic engineering of human-computer interaction*. Cambridge, MA, USA: MIT Press.

Dix, A., Finlay, J., Abowd, G., & Beale, R. (1998) *Human-computer interaction* (2nd ed.). Hemel Hempstead, UK: Prentice Hall Europe.

Eagleton, T. (2003). *After theory*. New York: Basic Books.

Greene, R. T. (2001). A garbage can model of creativity—the 4 cycle model—derived from a model of 42 models of creativity. *Kwansei Gakuin University's Journal of Policy Studies*, *11*, 1–204.

Koblum, J. (2006, January 8). Teens hang out at MySpace. *USA Today* [on-line]. Retrieved January 9, 2006, from http://www.usatoday.com/tech/news/2006-01-08-myspace-teens_x.htm?csp=34

Light, A. (2001). *Representing the producer: The use of semiotic analysis to inform the design of interactive components in networked media*. Paper presented at the Design Specification and Verification of Interactive Systems (DSVIS) Conference, 2001, Glasgow, Scotland. GIST Tech. Report G-2001-1 available from the Department. of Computer Science, University of Glasgow, Scotland, G12 8QQ.

Lynch, M. (2006). The origins of ethnomethodology. In D. Gabbay, P. Thagard, & J. Woods (Series Eds.) & S. Turner & M. Risjord (Vol. Eds.), Philosophy *of anthropology and sociology: Vol. 15*. *Handbook of the philosophy of science* (pp. 291–319). Amsterdam: North-Holland, Elsevier.

Manovich, L. (2001). *The language of new media*. Cambridge, MA, USA: MIT Press.

Mounajjed, N., Peng, C, & Walker, S. (2007). Ethnographic interventions: A strategy and experiments in mapping sociospatial practices. *Human Technology*, *3*, 68–97.

Packer, R., & Jordan, K. (2001). *Multimedia: From Wagner to virtual reality*. Scranton, PA, USA: W. W. Norton & Company.

Paul, C. (2003). *Digital art.* London: Thames and Hudson.

Welles, O., & Bogdanovich, P. (1998). *This is Orson Welles.* New York: De Capo Press.

Willis, P. (2000). *The ethnographic imagination.* Cambridge, UK: Polity Press.

Williams, R. (1988). *Keywords: A vocabulary of culture and society.* London: Fontana.

Wright, P., & Finlay, J. (2003, July). HCI, the arts and the humanities. A British HCI Group workshop, King's Manor, York, England.

Authors' Note

All correspondence should be addressed to:
Mark Blythe
Department of Computer Science
University of York
UK
mblythe@cs.york.ac.uk

CREATIVITY IN AMATEUR MULTIMEDIA: POPULAR CULTURE, CRITICAL THEORY, AND HCI

Jeffrey Bardzell
Indiana University
Bloomington, USA

Abstract: *The last decade has witnessed the emergence and aesthetic maturation of amateur multimedia on an unprecedented scale, from video podcasts to machinima, and Flash animations to user-created metaverses. Today, especially in academic circles, this pop culture phenomenon is little recognized and even less understood. This paper explores creativity in amateur multimedia using three theorizations of creativity—those of HCI, poststructuralism, and technological determinism. These theorizations frame a semiotic analysis of numerous commonly used multimedia authoring platforms, which demonstrates a deep convergence of multimedia authoring tool strategies that collectively project a conceptualization and practice of digital creativity. This conceptualization of digital creativity in authoring tools is then compared with hundreds of amateur-created artifacts. These analyses reveal relationships among emerging amateur multimedia aesthetics, common software authoring tools, and the three theorizations of creativity discussed.*

Keywords: *amateur multimedia, creativity, HCI, aesthetics, YouTube, machinima.*

INTRODUCTION

Pop culture has for years been loosely associated with mass media, specifically popular television, movies, fashion magazines, and so on. Yet control over popular culture by mass media is clearly eroding. Easy-to-use multimedia authoring tools, massive libraries of digital assets (including Google images), and community sites that encourage free uploads of multimedia creations have come together to enable a phenomenon—amateur multimedia— whose scale is incredible. Today this pop culture phenomenon is little recognized and even less understood in academic discourses.

Some quick numbers demonstrate the reach of amateur multimedia. Nearly 325,000 multimedia files have been submitted to Newgrounds[1], an amateur Flash community; YouTube[2] features approximately 65,000 new videos per day, many of which are amateur; Machinima.com[3] contains over 2,300 films shot and produced within video games; and Second Life[4], a massively multiuser participant-created 3D world, indicated on its home page that it passed 2 million subscribers in December, 2006.

Some individual works are achieving impressive distribution: The Numa Numa Dance[5], a low-budget video released on Newgrounds, exceeded 13 million downloads, spawned a subgenre—6,000 imitations to date—in its own right, and wound up on national news in the US. The phenomenon began when a young man danced, in his chair and in front of a Web cam, to a popular Romanian dance song, "Dragostea Din Tei." His infectious joy, though it displayed a certain amount of self-conscious irony visible to any Newgrounds regular, combined with the song's catchy melody to create a sensation that appealed to people both in- and outside the Newgrounds community, albeit in different ways. The video drops in seemingly random images, which are in fact references to other amateur animations from several similar communities. Using such images is a means of demonstrating one's membership in other communities, as is the viewer's understanding the references and their significance. The song, his dancing, and some of the memes he quotes all became memes in later animations (Paolillo & Bardzell, 2005).

Amateur multimedia is the locus of tremendous artistic innovation. The history of machinima is one example. Emerging from the gaming community's use of the unheralded recording feature in *Doom*[6] in 1994 that matured in *Quake*[7] in 1996, the art of filmmaking in virtual reality—which often involves storytelling, acting, and bragging—occurred in ways unanticipated by the games' publishers that inadvertently spawned it (Salen and Zimmerman, 2004). Since then, the genre has flowered to the point that popular games, such as *The Sims 2*[8], bundle machinima tools with the game, and new machinima genres, from music videos to sit-coms, have appeared. Entire Web sites, such as Machinima.com are devoted to it, and these feature long-running series, such as the seminal machinima sitcom, *Red Vs. Blue*[9]. As the tools improve, aesthetic values have also started to appear, as communities learn not only how to use the technology to make these movies, but more importantly how to make them *well*.

This paper explores the enabling factors, especially the role of multimedia authoring tools, in the recent explosion of amateur multimedia. It takes cues from both human-computer interaction (HCI) and cultural studies discourses, arguing that neither one on its own is sufficient to understand the continued development of the phenomenon.

HCI practitioners have explored how software interfaces can enhance and support users in general and creativity in particular. Its analytical tools for examining the relationships between tools and a concrete group of users vis-à-vis a well-defined explication of tasks both solve and create problems. The ability to specify these relationships explicitly greatly facilitates the design of systems; yet that same explicit specificity also defines creativity *a priori* in cybernetic terms more friendly to computers than to the culturally diverse and rich practice of creativity.

Critical theory—an umbrella term that encompasses literary theory, continental philosophy, and communication theory, among others—offers sophisticated theoretical resources for the study of cultural artifacts and their use in the communities that create them. Many of these theories ground themselves in the materiality of the cultural artifacts they study; yet the material layer for which these theories were once developed were largely textual. The movement of cultural artifacts from the physical to digital poses a deep challenge (and some risk) for critics studying digital media with these theories.

To improve our understanding of the intersections of creativity, technology, and culture, this paper investigates three relevant traditions of theory that address these overlaps: HCI, poststructuralism, and theories of technological determinism, especially in media. From there, the paper uses a semiotic approach to explicate the materiality of the software authoring tools

that people use to practice creativity, presenting a snapshot of creativity derived from software interfaces today. Finally, it explores the relationships between specific tools as implementations of this snapshot relative to the work of amateurs using these tools.

THEORIZING CREATIVITY

Creativity—its nature, conditions of possibility, inputs and outputs, and processes—plays a major role in virtually all academic, professional, and artistic domains. As a result, it is heavily, and heterogeneously, theorized. Indeed, it is reasonable to ask the extent to which different domains' use of the word *creativity* are talking about the same concept.

To construct a basis for comparison across disciplines, some characteristics of creativity considered include the following:

- *Agency*. Who or what causes creative activity? Does it occur in an individual's cognition, distributed across a social network, performed during an encounter with existing creative artifacts (e.g., texts), and so on?
- *Supports and scaffolds*. What characteristics, external to acts of creativity, appear to support them? Can heuristics create environments encouraging to creativity? What is the role of free association, play, and experimentation? To what extent do specific technologies, cultural logics, and communities predetermine creativity possibility?
- *Artifacts*. What kinds of artifacts are particularly understood or marked as the result of creativity? How are they marked (e.g., by the creator, a community, or discursive features in the artifact itself)? How are they recognized as marked?

Obviously, these three characteristics are far from a philosophical theory of creativity. Their intention is to be functional and to enable a broad comparison among different theoretical traditions of creativity.

Creativity in HCI: Toward a Science of Innovation

Genealogically, HCI developed alongside cognitive science and computer science, and was most often put in service of professional productivity software. Certainly, HCI has expanded beyond these roots, and yet this genealogy often leaves a mark on its conceptualizations of creativity. HCI often is (self-)described as a scientific discipline, which divides human-computer interaction into users (Beyer & Holtzblatt, 1998; Kuniavsky, 2003), tasks (Annett & Duncan, 1967; Crawford, 2003; Rheingold, 2001), and interfaces (Schneiderman, 1998).

HCI often characterizes creativity in rationalistic, intentional, and scientific ways. For example, Schneiderman (2002, 2003) proposes a creativity framework for, in his words, "generating excellence" with four parts: collect, relate, create, and donate. With it, he hopes to capture the social, iterative, associational, and distributional characteristics of creativity, especially as described by cognitive science. Evident in this perspective is an effort to model creativity, which is seen as a social activity, with certain structural features that take place in environments conducive to creativity. All of this is in service of what Schneiderman calls "evolutionary creativity," which he illustrates as follows: "doctors making cancer diagnoses, lawyers preparing briefs, or photo editors producing magazine stories" (2002, p. 238). Here,

and pervasive throughout the essay, Schneiderman's notion of creativity appears to be paraphrasable as professional innovation: His interest is not artistic self-expression and, as we shall see, he is not alone in understanding creativity in terms of professional discourses.

Greene's (2002) essay in the *Communications of the ACM,* titled "Characteristics of Applications that Support Creativity," abstracted features of creativity-supporting software, based in large part on user observations of an art appreciation public kiosk application, "Explore Modern Art." The language of the essay communicates a number of predispositions concerning creativity. Greene, an IBM HCI researcher, writes that, where creativity is concerned, there "should be no big penalties for mistakes, and there should be meaningful rewards for success" (2002, p. 102), thereby introducing a strong notion of correctness, a concept that appears throughout the essay. She also emphasizes the importance of system feedback, because it "promot[es] a sense of *control*" (Greene, 2002, p. 102; italics added). Appreciation of modern art is developed through games that involve users in acts of "*classification,*" which, when done correctly, involve the "reward" of "more *information*" (p. 103; italics added). The researcher describes how the visitors of the art appreciation system would "develop a *hypothesis*" to help them iterate toward correct choices (p. 104, italics added). In Greene's essay, creativity is a computer-supported experience of art defined in terms of conventional (art historical) interpretation, as opposed to a direct, subjective experience of art (Sontag, 1981/2001). Again, creativity is understood as it relates to professional discourses, in this case the discourse of art history and its pedagogical presentation to museum-goers.

Even analyses of group creativity in HCI contexts that seek to go beyond rationalist-individualist notions of creativity nonetheless operate in a rationalist mode. For example, Farooq, Carroll, and Ganoe (2005) construct a classificatory system to model creativity phenomena and subsequently design corresponding software/interface features explicitly intended to support the modeled phenomena.

The notion of creativity that emerges from these mainstream HCI essays places its agency primarily in the intentional activity of the individual (though the individual is presumably a member of relevant groups). It sees the ecology of creativity as a community of expert practice comprising research, dialogue, and artifact exchange, facilitated by social and computer environments that forgivingly compel an iterative and basically scientific (correctness, discrete information, classification, hypothesis) approach toward truth. Its artifacts are the documents and discourses produced by domain experts, measured in large part by a correspondence theory of truth, that is, the extent to which the creative discourses correctly map onto external reality.

Poststructuralist Creativity: The Death of the Author

In his 1969 essay, "What is an Author?" Michel Foucault treats the notion of the author as a discursive construct, used to explain and control the meanings of texts. Instead of a historical person, or even a single narrator, Foucault introduces the notion of the "author-function." The author is understood as a discursive category that establishes the "mode of being" for a given discourse, by which Foucault means the ways that "the author's name manifests the appearance of a certain discursive set and indicates the status of this discourse within a society and a culture" (Foucault, 1969/2000, p. 211). The author has lost her or his humanity and become a feature of the discourse.

The role of the author-function is, among other things, to control the polyvalence intrinsic to texts, such that the author, rather than performing the *creative* role of bringing the text into the world, performs the role of *constraining* the meaning of the text within a society. For example, if a newly discovered poem is identified as one of Shakespeare's, the meaning of the poem is controlled because the interpretation of the poem must be subordinated to the body of Shakespeare's works, their historical development, and Shakespeare's biography. In other words, the attachment of Shakespeare's name to the poem affects our understanding and use of it much more deeply than anything the poem itself may be understood to say on its own.

Alongside Foucault's notion of the author-function is a theory of writing. According to this theory, "Writing unfolds like a game that invariably goes beyond its own rules and transgresses its limits. In writing, the point is not to manifest or exalt that act of writing, nor is it to pin a subject within language; it is, rather, a question of creating a space into which the writing subject constantly disappears" (Foucault, 1969/2000, p. 206). Therefore, writing is a destabilizing force that threatens to transform the discourse in which it operates and to swallow up its own author. It is important to remember that Foucault is not limiting his analysis to literary texts; he explicitly includes scientific and academic writing, thus making claims about the same types of discourse in his theory as the ones Schneiderman (2002) describes.

But what a contrast! Where creativity for Schneiderman is located in cognition, which he extends to include "distributed cognition," for Foucault cognition understood as a mental process tied to the individual subject does not appear to be anything other than a fabrication wrought by psychology. Where Schneiderman (2002) and Greene (2002) concentrate on intentional uses of information to discover truth, Foucault (1969/2000) denies the possibility of a unified author or even a unified work, let alone truth.

The unity of the author is a post hoc construct, according to Foucault. Even in a mathematical treatise written by a single author, Foucault sees a number of speaking selves: "The self that speaks in the preface to a treatise on mathematics—and that indicates the circumstances of the treatise's composition—is identical neither in its position nor in its functioning to the self that speaks in the course of a demonstration, and that appears in the form of 'I conclude' or 'I suppose'" (Foucault, 1969/2000, p. 216). One of these selves is the historically accidental self, who composed the treatise in such-and-such circumstances; another is a universal self, the any-scientist who, using the same mathematical symbolic system and axioms, will arrive at the same results. Even those rare authors—such as Marx and Freud—who go beyond "mere science" to achieve the elevated status of "discursive founders" are important not because of who they were or the ideas they introduced, but rather because they "have produced … the possibilities and the rules for the formation of other texts" (Foucault, 1969/2000, p. 217). In other words, discursive founders achieve their elevated status because they produce new discursive grammars, entire new sets of rules for others to transgress in their own writings.

In this conceptualization of writing, creativity occurs at the level of discursive rule-transgressing. The role of the historical human in this process is greatly diminished, not because humans are not involved in textual production, but because the individual is at the wrong level of granularity for analysis. A given historical individual authoring discourse does so within complex interactions involving several selves and the clash of languages.

Related, but not identical, to Foucault's notion of authorship are theories of "intertextuality" put forward by Julia Kristeva and Roland Barthes. Intertextuality is the notion

that a text is a "tissue" of (mis)quotations from other texts, considered to be more than mere collages, but transformative, of the sign systems from which they are derived (McAfee, 2004). The writer "stages" these intertextual pastiches but has no authority to control or regulate the responses, leaving behind "play," that is, an unpredictable and emergent clash of texts and constructions of meaning, and *jouissance* as its consequence (Orr, 2003). Such theories clearly inform more recent theories of new media, including Bolter and Grusin's (1999) concept of "remediation," which characterizes "new" media as "refashionings" of "old" media.

The poststructuralist notion of the death of the author distributes the loci of creativity across different authorial selves, different discursive rule systems, and human pleasure. Dangerously polyvalent pleasure, experienced in the vistas opened up by transgressive innovations in the rules of discourse, replaces truth and unity in the poststructuralist account of creativity. Creativity's agency lies in the juxtaposition of sign systems (in which authorial identities are implicated), which occurs in the context of play, and results in artifacts that are significant not for what they say, but for the ways they materially contribute to the generative capacity of the discursive rule-set from which they operate.

Technologically Determined Creativity

Perhaps the foremost theorist of technological determinism is Jacques Ellul (1964/2003, 1980/2003), who argues that individuals, science, and government are all "conditioned" by technology. The production of knowledge and the operations of the state involve relations between people and resources, and yet all of these are mediated by technology. However, technology has its own logic—Ellul (1964/2003) identifies it as the endless pursuit of pure, rational efficiency in every field of human activity—and though technology transforms virtually all fields of human activity, it is itself unaffected by them. Like Schneiderman (2002, 2003) and Foucault (1969/2000), Ellul (1964/2003, 1980/2003), too, is making claims about the origins and generation of knowledge in scientific discourses, but he situates the agency in the fierce pressures of technology as it overwhelms and often replaces the comparatively meek procedures of science and governance.

Ellul's (1964/2003, 1980/2003) emphasis on technology's mediation of the production of knowledge recalls the work of Walter Benjamin, whose essay, "The Work of Art in the Age of Mechanical Reproduction" (1936/1968), unpacks the meanings, social relations, and perceptual transformations caused by the emergence of mechanically reproducible art, such as film. The transition from nonmechanically to mechanically reproduced art changed the relationships among art producers, consumers, and works themselves. Benjamin contrasts the production and consumption of the stage versus film and notes that whereas plays on the stage are viewed from within a space-time continuum that links performance, viewing, physics, perception, and cognition, the production of film and its consumption occur in different spatiotemporalities, changing, for example, the relationships between the viewers and actors. Film's use of shots and cuts also disrupts space and time, presenting images to human perception that are external to our own physics; for example, a cut between a long shot and an extreme closeup moves our view instantaneously across space without requiring any time. As a result, according to Benjamin, our cognitive experience of the art also changes; whereas painting allows spectators to control their own stream of consciousness and reflect on what they see, cinema's moving images disrupt association and contemplation, dominating viewers' thoughts.

Benjamin's (1936/1968) technological determinism is not as full-blown as Ellul's because technology is but a part—an important one, to be sure—of the substructure-superstructure system that dominates a cultural mode in Benjamin's Marxist theory. Nonetheless, Benjamin's essay demonstrates how changes in technology alter techniques of production, which in turn transform the experience and meaning of art, and thereby the nature of culture itself.

Benjamin's (1936/1968) arguments are developed further by self-described technological determinist Marshall McLuhan, whose claim that "the medium is the message" (1964/2003) characterizes media as "extensions of ourselves" that "alter sense ratios or patterns of perception steadily and without any resistance" (p. 31). The result is that "subliminal and docile acceptance of media impact has made them prisons without walls for their human users" (p. 34). For McLuhan, media, and the technologies that enable them, replace the senses, where the senses are understood to form the basis of knowledge and understanding.

More recently, new media theorist Lev Manovich (2006) has made arguments with technological determinist underpinnings. For example, in a draft of an as-yet unpublished essay, Manovich largely credits Adobe's After Effects as spearheading a revolution in media:

> [A]s software remixes the techniques and working methods of various media they simulate, the result are new interfaces, tools and workflow with their own distinct logic. In the case of After Effects, the working method which it puts forward is neither animation, nor graphic design, nor cinematography, even though it draws from all these fields. It is a new way to make moving image media. Similarly, the visual language of media produced with this and similar software is also different from the languages of moving images which existed previously. (Manovich, 2006, p. 20)

For Manovich, the emergence of new visual languages is enabled not by an iterative, rational approach to innovation, as cognitive science might suggest; neither does it emerge from an evolutionary history of discursive transgression, as a poststructuralist approach might suggest[10]. Rather, it is made possible by certain forms of productive convenience built into authoring tools that unleash visual languages and cultural logics that exceed any human intention, whether at the level of the individual or the group of experts.

Common to the technological determinist arguments is the notion that technology mediates our perception of and interaction with the world; as a result, it *constitutes* the meaning and significance of our actions. The act of creativity is understood as the capitalization of how media technologies alter sense ratios and the scale of human understanding; that is, creativity entails the act of discovering and extending the hidden logic of technological media forms.

Towards a Notion of Digital Creativity

This snapshot of three traditions of creativity obviously skims over the nuance of the traditions. Not all of HCI, for example, aligns itself with scientific rationalism. But the broad brush strokes should at least suffice to demonstrate three very different, yet mainstream in their respective domains, theorizations of creativity. I began this discussion by asking whether there was any creativity shared by all three of these traditions, or if instead we are left with three creativities,

each of which manifesting itself as a domain-centric construct whose purpose is to mark certain artifacts as having introduced a discursively acceptable un-thought into that domain.

To answer this question, it is useful to consider what the three traditions share in common. All consider creativity in the context of professionalism and *knowledge production*. Creativity is not simply about painting a pretty new picture or expressing a personal emotion; it contributes to discourses about the world and our place in it. All three traditions also understand creativity as situated within *systems*—networks of software-supported experts, discursive sign systems, or systems of production and consumption. All of these implicitly reject romantic notions of the individual creative genius and pure self-expression; implied in this is a rejection or at least dilution of individual intention as the prime mover of creativity.

Clearly, in spite of their differences, the three conceptualizations have commonalties. One approach to improving our understanding of the theories is to put them into a dialogue with a domain of creative practice. I suggest that amateur multimedia might be particularly instructive in this regard because it is a large-scale phenomenon, fueled by recent advances in end-user software, with an incredible variety of readily available artifacts. Further, the very amateurism of the artifacts is likely to reveal the influences of authoring software interfaces, methods, and constitutive contributions toward a visual language or cultural logic, especially when compared to professional multimedia, in which the creative agency of the professional designer is more likely to resist or at least obfuscate the agency of the software.

Questions one might ask include the following: What are the social and technical conditions or structures necessary for the generation of these artifacts? What is the discourse of amateur multimedia? What is the minimal unit of meaning? In what ways does its production establish relationships between authors, viewers, technologies, meaning, and ideology?

CREATIVITY, ACCORDING TO AUTHORING SOFTWARE

A key first step is to understand how creativity is implemented in multimedia authoring software. Each program has ways it encourages authors to work. For example, Photoshop greatly rewards users who take advantage of layers, opening up avenues of possibility for compositing, nondestructive experimentation, and long-term editability. This in turn makes certain meanings (especially meanings created by the juxtapositions of spatial compositing) more easily realized than others. To what extent do contemporary authoring platforms encourage in the same ways (constituting and compelling a notion of digital creativity), or do different applications suggest different notions of digital creativity?

The second step is to study works of amateur multimedia looking for artifacts of the authoring tool's projection of creativity. Case studies at the end of this paper explore these relationships, but let us first explore what creativity means according to multimedia authoring software.

Methodology: Paradigmatic/Syntagmatic Analysis of Multimedia Authoring Platforms

To discover the notion(s) of creativity projected by authoring software, I sought a common descriptive language with which I could analyze the different platforms. Continuing prior

work in this area (Bardzell & Bardzell, 2005), I used a pair of related concepts from semiotics: paradigms and syntagms. First developed by Barthes (1967/1990) using concepts derived from Saussure (1915/1966), this concept has been deployed in film theory (e.g., Metz, 1971/1974) and in new media theory (Manovich, 2001) to identify ways that elements of sign systems are used together to create meaning that goes beyond the aggregated meaning of the individual elements. Typically, these concepts have been deployed to study cultural artifacts in the traditional sense (films, texts, video games), but I used them to study multimedia authoring platforms (which are, after all, cultural artifacts).

A *syntagm* is a "grammatical" sequence of signs. "Sally kicks the ball" is a valid syntagm in English, but "ball the kicks Sally" is not. Syntagmatic connotation in film theory refers to ways that meaning originates from certain sequences of shots, for instance, in parallel editing, which goes beyond the aggregation of the denotative meanings of each of the shots. A *paradigm* is a replaceable unit, which is to say a class of unit, within a syntagm. Thus, we can change "Sally kicks the ball" to "Roger kicks the ball" or "Sally composes a poem" simply by making paradigmatic changes (replacing the subject noun with a different subject noun, etc.).

To study the use of multimedia authoring interfaces, I applied these concepts to explore the legal *sequences* of actions designers could follow, and to explore the *paradigmatic classes* of options within those sequences. I used this approach to study several common multimedia authoring tools, making a conscious effort to represent different kinds of multimedia art:

- Adobe Flash: a 2D animation program often used for Web ads, cartoons, and simple applications;
- Electric Rain Swift 3D: a simple and inexpensive 3D modeling program;
- Adobe Fireworks: an image editing application commonly used for Web graphics;
- Apple GarageBand: a music composition application, which relies largely on a library of pre-made loops, often used in podcasts;
- Apple iMovie: a consumer-level video editing application, renowned for its ease of use, but which lacks a deep feature set;
- Activision's Advanced Movie Maker: a simple machinima production and post-production application, which comes bundled with the video game, *The Movies*;
- Linden Labs' Second Life: a participant created massively-multiplayer online game/social space, which has its own simple 3D modeling environment, scripting language, and import capabilities; used to create 3D "builds" such as clubs, cities, and homes.

Obviously, I focused on tools used by amateurs. While Final Cut Pro is far more sophisticated than iMovie, I see little evidence that Final Cut Pro is regularly used by amateurs on, say, YouTube, while evidence abounds[11] for the use of iMovie and Windows Movie Maker. In each platform, I authored the kinds of artifacts I found in amateur communities, recording the sequences of actions I took as I did so.

Results: Syntagms of Multimedia Authoring

The similarities among these programs were striking, regardless of the genre they were intended to produce (music, animations, digital photographs) and the overall sophistication of

the program (e.g., Flash is much deeper than iMovie). Manovich (2006), too, finds structural similarities across a diverse range of authoring platforms, especially in their particular use of layers and compositing and, more abstractly, space and time. He explains these similarities genealogically, demonstrating how they derive from prior traditions of media production (film, multitrack audio recording, graphic design, etc.). Manovich stops short of spelling out these similarities as a *system*, though he clearly sees many of the particular elements as related.

In this section, I provide a sample syntagmatic analysis, which I explicate using Flash and other programs as running examples. I also sketch out the system of syntagms common to multimedia authoring programs to provide a more general view of multimedia authoring applications.

A Sample Syntagm: Preparing Static Art Elements

In the following discussion, I understand a syntagm to be a more or less stable sequence of actions required to accomplish a particular design task. As a running example, we will explore the syntagm of preparing a simple art element, a common process in all of the multimedia authoring applications I studied. In these applications, this syntagm comprises the following sequence (and assumes a document has already been created):

1. Identify a location in space and time in which to work;
2. Create the element;
3. Specify the element's relationship to the remainder of the composition.

A paradigm is the set of possible actions that constitute one step in that task. Thus, in the syntagm of preparing art elements in the music composition application GarageBand, the first paradigm—location of space and time in which art creation takes place—includes as options a layer of the main timeline, the loop browser, or the Real Instrument audio import interface. Flash, an animation program, also has the location in space/time paradigm, though its particular options differ: One may situate artistic creation in a blank portion of the canvas, in a new layer, in a new symbol, in the Import dialog, and so on. Likewise, in iMovie, users may create new content in various locations: video import in the monitor in camera mode, image/audio import in the Media section of the library, setting in and out points in the clip library, compositing titles and video using the timeline and the Titles tab of the Editing section of the library, and so on.

We can also see various paradigmatic options for the second step of the syntagm for preparing a simple art element: creating the element. In GarageBand, users can record themselves singing or playing acoustic or digital instruments (e.g., MIDI keyboards and guitars) or they can choose loops from GarageBand's extensible loop library. In Flash users can draw a new element with one or more of Flash's drawing tools, such as the Line or Pen tools; they can create a visual element from simple units, such as ovals, rectangles, and stars; and they can create instances of complex, ready-made elements, such as the data-driven Accordion component. In iMovie, users can create new content by importing video, images, and audio they already have; they can design titles, transitions, and special effects; and they can even prepare their videos for burning to a standard DVD, complete with chapters and menus.

Stated more abstractly, we can see patterns emerge among the paradigmatic options. Art is created at different levels of elemental complexity. For example, users can create art *from*

scratch (that is, starting from a blank canvas, without any predeveloped content) in this second step of the syntagm: plotting out vectors with the Pen tool in Flash or Fireworks, plotting points and creating a 3D object out of them with the Lathe tool in Swift 3D, recording a guitar riff into GarageBand, or recording digital video and importing it into iMovie. But users can also take advantage of computer automation when creating art. They can create art *from primitives*, which are more complex basic elements than vector points or individual piano notes. These include 8-beat drum beat loops in GarageBand; seven-sided stars created with the Polystar tool in Flash; cubes, cylinders, and cones, available in Swift 3D and Second Life; or titles and optical effects (such as transitions) created with the Titles tab of the Editing section of the library in iMovie (Figure 1). Most programs can import external files, which are effectively used as primitives. An even more advanced use of computer automation in the creation of art includes the creation of art *from components*, which are visual elements of significant complexity, the details of which are often presented as a "black box" to their users. Examples include Flash components, such as the data-driven Accordion component or the Media Playback component; standards-compliant 3D models, such as chairs, hammers and race cars, available to many 3D programs, including Swift 3D; 3D humanoid avatars, which Linden Labs (makers of Second Life) distributes to Poser animators, who want to design their own animations for use in Second Life; and fully themed filming sets, such as the Old West Saloon, used in Activision's Advanced Movie Maker for *The Movies*.

For brevity, we need not explore in depth the third step of the simple art creation syntagm, which involves specifying its relationship to the remainder of the composition. Suffice it to say that timelines (for specifying temporal relations) and canvases (for specifying spatial relations in 2D space) and virtual cameras or viewports (for seeing and positioning objects in 3D space) are nearly universal interfaces for handling this step. Object nesting (building complex objects out of grouped simple objects) is another way of specifying relations. The organizational mechanisms may have different names—other names for the canvas include artboard, page, stage, slide, and monitor—but they are experienced and used in deeply similar ways (e.g., zooming, panning, etc.).
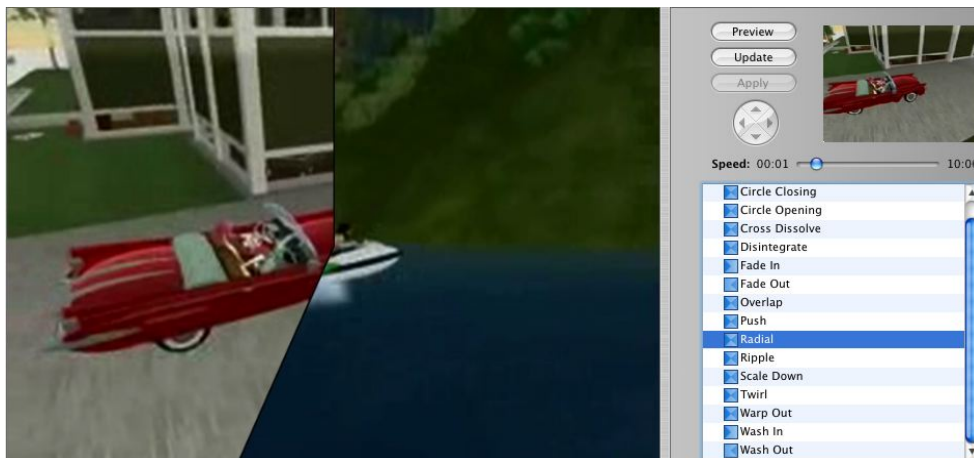

Figure 1. Transitions between shots, such as Radial shown here, are selected from lists and added as primitives in iMovie.

Identifying syntagms in a software application resembles task analysis, a practice common in HCI, with a few key differences. First, the sequence of behaviors is studied from the point of view of the interface, rather than the intentionality of the user; syntagmatic analysis is not, at least at the most superficial level, human-centered. Another difference is that the use of semiotic vocabulary facilitates the standardization of the resulting descriptions, such that they are more easily compared with those of other applications. Finally, the semiotic vocabulary shifts the focus from the accomplishment of a discrete task with the software as an instrument of human will toward a notion that *meaning* emerges from the interaction between the sign system in the abstract (what Saussure, 1915/1966, calls *langue*) and its actual, everyday use in practical contexts (*parole*). The semiotic lens provides a tool to reconfigure and reinterpret a technique from HCI (Andersen, 2001).

How do the three paradigmatic options for art element creation (i.e., from scratch, from primitives, and from components) yield *meaning* when placed into practice? Each of them implies different interfaces and user behaviors, which in turn shapes the nature of the art created, and hence its meanings. Creating art elements from scratch often involves specialized tools (Pen, Pencil, Brush) and even hardware (MIDI keyboards, Wacom graphics tablets, MiniDV video cameras). They often assume traditional artistic ability, the ability to create art competently with one's hands. Using primitives, in contrast, is automated within the software interface, commonly involving simple customization tools, such as position, scale, skew, and distort, and dialog boxes (number of points on star, text and background color for video title, file location for imported bitmap file). The creating from primitive paradigmatic option works best when the user has a sculptor-like ability to perceive relations between simple elements and complex final forms, along with the ability to work from the former to the latter. Creating elements with components usually involve relatively technical configuration interfaces—wizards, palettes, inspectors (windows that reveal the properties of art objects, such as positioning, color, and duration)—to enable authors to use them in flexible ways; for example, the Tree component in Flash simplifies and automates creating interactive tree widgets, such as navigation systems, in the Flash Player—if the user can understand its inspector (Figure 2).
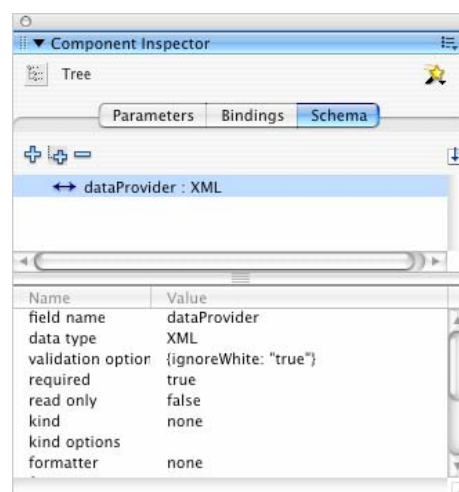

Figure 2. Flash components automate the creation of programmatic interactions, but still require technical skills.

Clearly, the three paradigmatic options can be seen as more or less appropriate for the creation of certain kinds of art. For example, a Flash artist seeking a painterly look should make heavy use of the drawing tools (though doing so may have adverse implications for animation later on). But the theoretical ability to rationally match interface paradigms to artistic outputs aside, we need to recognize that each implies its own skill sets—and this is especially crucial for amateur multimedia. How many amateur Flash artists are both accomplished at draftsmanship and also able to programmatically bind live XML data to a tree component? Not many. And that means that individual amateur Flash works tend to privilege one art creation paradigm option over others, not because users rationally match their paradigmatic choices to the materiality of their art and their message, but rather because users choose the tools with which they are the most competent.

Summary Sketch of Multimedia Authoring Paradigm Categories

The preceding section offered a close look at a single paradigm (art element creation) within a single syntagm (art element preparation), more or less common to all of the platforms studied. In this section, I sketch what I regard as the primary syntagms of multimedia authoring, by identifying some of the common paradigms that can be found in many, if not all, of the platforms (Figure 3).

I begin with a distinction: Many of the syntagms involve the creation, ordering, and customization of art elements at a material level; the rest of the syntagms are in a sense external to the art elements themselves, having more to do with the authoring or playback environments (e.g., view, export).

Syntagms pertaining to the materiality of the art itself reflect the hierarchical and object-oriented nature of modern computing. That is, some of the syntagms are specific to lower-level elements (e.g., the individual lines that make up a drawing, primitives that make up a model, individual shots of video, and individual loops within tracks of audio); some of the syntagms are specific to higher-order elements (vector-drawn faces or animation scenes, full 3D models, complete video sequences, major sections of music compositions).
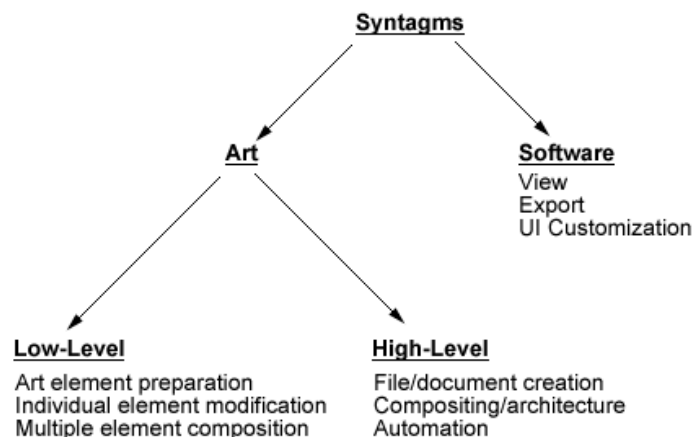

Figure 3. A sketch of syntagms common to most multimedia authoring platforms.

Syntagms of art manipulation at the lower level include the following: *art element preparation*, discussed earlier; *individual element modification*, which includes filters, effects, color palettes, sound envelopes, textures, animation presets, size, scale, position, distortion, lighting, audio extraction, among others; and *multiple element composition*, which includes operations such as flatten, union, blend modes, opacity, layers/arrange, masks, grouping, text on a path, motion guides, lighting, and video optical effects.

Syntagms of art manipulation at the higher level include *file/document creation*, including resolution and aspect ratio, margins, tempo and key, frame rate, color mode, and so on; *compositing/architecture*, such as external media import, including libraries, timeline blocks (e.g., scenes), project managers, and object hierarchy management; and *automation*, such as batch processing, global find and replace, Magic Movie (an iMovie feature that automates the entire moviemaking process, from importing raw footage, inserting transitions, and outputting to a DVD), distribute-to-layers/frames, symbol (class) manipulations that affect all instances (objects), and recording and saving macros.

Syntagms not pertaining to the materiality of the art, but rather to the authoring platforms themselves include the following: *view*, including zooming, panning, perspective, custom cameras, units of measurement, scrolling, VCR controls, onion skinning (which allows a view of multiple frames of an animation), and layer toggles (such as lock, visible); *export*, file optimization, codecs and compression, resolution, file type, and so forth; and *interface customization*, which includes custom toolbar/palette layouts, saving one's own primitives and components into the interface for later use, and even scripting custom interface commands/features via built-in application programming interfaces (APIs), the custom scripting environments that enable advanced users to configure and extend interfaces and commands to suit their needs or automate certain tasks.

Each of these syntagms contributes to the construction of art and meaning. For example, initial choices when creating a new document do not merely set the document edges; they establish the relationships among the elements within the composition and even with the audience; for instance, setting a 16:9 aspect ratio makes even a still-blank composition more cinematic than a 4:3 aspect ratio.

The Reconfiguration of Art as Data

Of deeper significance is that, with superficial variations, all of the applications investigated had just about all of the syntagms listed above, and few or no syntagms not listed. The implication is that all of these applications, then, have a similar language of creative expression and correspondingly project a similar notion of creativity. Indeed, the object-oriented nature of modern computing is the prime mover, as it underpins the nature and structure of artistic data (conceptualizing art as composed of data is the critical step here). Here I am echoing Manovich's (2001) first principle of new media, which is its "numerical representation," and specifically how it grounds the possibility of algorithmic manipulation of art in the first place. That the materiality of art is now data gives rise to the possibility of algorithmic manipulations of that data, and these possibilities for algorithmic manipulation make possible tasks and interfaces. Given that all forms of digital art have the same basic material (data), it is therefore not surprising that for all their apparent diversity, multimedia authoring applications are so fundamentally similar.

This particular view contrasts with the more traditional notion that interfaces are built out of metaphors and practices derived from traditional analogues to design so, for example, the notion of layers in many software applications replicates the acetate layers once used in page layout. Obviously, software interfaces *do* make use of traditional design techniques, but it is also evident, especially if one considers the evolution of a given program over time, that software applications tend to move away from their design origins and toward the logic of computing. For example, whereas Photoshop 1 in many ways was a digital darkroom, Photoshop CS2 (which corresponds to version 9) is loaded with automation features (such as batch processing and "magic" pixel selection tools), application interoperability (e.g., Adobe Bridge, the File Browser, import/export features), nondestructive editing, vector drawing, 3D perspective grids, and other characteristics quite alien to the darkroom. That most of these latter features are common to many types of authoring application suggests that the underlying data of digital art is the grounds for a profound convergence of artistic production, organization, and storage across media forms—photography, animation, film, page layout, illustration, and 3D modeling—hitherto quite separate.

CHARACTERISTICS OF DIGITAL CREATIVITY

Several characteristics emerge that define creativity as it is practiced in multimedia authoring applications. These can be derived inferentially from the semiotic analyses of the authoring platforms themselves and seen empirically in artifacts from amateur communities. In this section, I present several principles of digital creativity that have been derived from this double-process.

HCI and Creativity: The Usable is the Message

Among its accomplishments, HCI has demonstrated that usability is strongly correlated to success. In amateur multimedia, this would suggest that the easier or more visible a feature or tool is in the interface, the more likely it is to be used. One simple example illustrates this point: Flash has a robust toolset for the design of gradient fills. A gradient is a color blend that transitions subtly from one color to another, and are often used to fill in the outlines of simple shapes. Gradients are also used to fill circles to produce the illusion of 3D, where a bright color near the center of the circle corresponds to the location of the light source striking the ball, and then the color gradually becoming darker as it moves away from this spot, simulating shadows. The issue is that many amateurs do not know what gradients are, much less how to mix them. Yet a small selection of gradient presets is built into the Color Mixer palette, a default collection of color presets readily available in the interface. On Newgrounds, one sees these particular gradients unusually often, in their default colors, even though the user is only two clicks away from choosing a new color.

A more significant example is the lack of layers in consumer video editing applications, such as Apple iMovie and Windows Movie Maker. Layers are used in many multimedia applications, from image editors to animation and high-end video editing. Layers enable spatial compositing, such that one element against an otherwise transparent background can be placed on top of another. That iMovie lacks layers means that it is impossible to have

more than one image track. Certainly, multiple image tracks are common enough in other applications, and we are accustomed to seeing spatial compositing in much of our media today, from news tickers and channel overlays to digital effects in Hollywood films. Conceptually, everyone making amateur multimedia has mastered this concept, and in Flash communities, its use is rampant. But at YouTube, a site with hundreds of thousands, if not millions, of amateur videos, spatial compositing is uncommon (not counting posts of professionally produced video, such as segments from *The Daily Show*[12].

Though spatial compositing is uncommon in iMovie and Windows Movie Maker, temporal compositing is the norm. iMovie has a timeline, which makes it easy to manage art assets—discretely defined video shots, titles, and transitions—temporally. More difficult is temporal compositing involving separate audio and video tracks, such as sequences with a master shot and some cutaways with a continuous audio source. Predictably, amateur YouTube videos comprise sequences of shots in which the audio and video are locked together, sprinkled with occasional transitions and titles. They also frequently display jump cuts (which occur when two similar shots are cut together, creating a jarring jump in the video) considered bad form in serious film editing. The most evident reason for jump cuts is that amateur YouTube videos are usually made with a single camera and operator (usually the same person as the actor/director), making multiple camera angles, and therefore the kinds of cuts useful in preventing jump cuts, prohibitive. This is consistent with the phenomenon that amateur YouTube videos tend to be personal, confessional, and intimate. They are not cinematic and often not even narrative. YouTube, along with Grouper[13] and podcasting, is the locus of the birth of a major new nonnarrative genre of film, perhaps the first since the documentary.

An interesting genre commonly seen at YouTube and Grouper is the *mashup*, a predominantly audio form that remixes two or more songs together. That these audio remixes are posted at YouTube and Grouper—both video sites—means that the mashups need to be presented as videos, that is, with image tracks. In many cases, the "videos" feature a single title screen that statically accompanies the song for the full 3 to 4 minutes of its duration. Others, such as "Mashup History"[14], enhance this by creating a simple slide show with few than a dozen slides that show as the song plays. Creating content from scratch in iMovie or Windows Movie Maker takes too much effort; mashup artists resort to primitives (in the form of built-in titles) to fill in the gaps.

Poststructuralism and Creativity: Found Art Drives Meaning

A staple of graphic design for decades has been the use of stock art—high quality photos and illustrations that designers could purchase and use in their newsletters, magazine ads, and billboards. Digital media, by virtue of its object-orientation, is portable. Today, Google Images already functions as Everyman's version of professional stock art services, such as PhotoDisc or Getty Images. More radically, many applications are able to insert a number of different types of media in their "documents." In the mid-1990s, when I first saw video in a PDF document, I was amazed; today, I expect music, video, photographs, and interactive menus and data visualizations during my browsing.

The logic of multimedia encapsulation can go in two directions: quantity and quality. By quantity, I refer to, for example, Flash movies that composite video, photos, text, music, and

so on into single aesthetic works. By quality, I refer to the ability of an encapsulated medium to contribute to the elaboration of new aesthetics in the parent medium. An example of this is machinima, whose emergence is founded on an as-yet unresolved clash of cinematic and video game logics, and they tend to fall into what I call "cinematic" versus "ludic" categories of machinima.

Cinematic machinima features narratives shot in the world of a particular video game. Many of these films continue with the aesthetic of the game. Thus, Halo machinima makers use Halo's sci-fi environs and guns to make futuristic action adventures; makers of machinima from Activision's The Movies, which parodies B-movie genre films, often make melodramas. Many cinematic machinima films use the logic of cinema to expose and parody the absurdity of games, such as *Red Vs. Blue*, a sit-com shot inside of a Halo multiplayer map, in which its characters often try to understand game conventions (such as unmotivated combat) in literal-minded, real-world ways.

Ludic machinima feature the logic of video games, which includes game rules, physics, and, above all, play (Aarseth, 2004). Machinima featuring play with game physics abound on the Web, including videos of people blowing their avatars' bodies to improbable heights[15], clearly not a part of primary game play but rather for sport. In this type of film, the found art is the physics engine of the video game, and it is used in the same kinds of surprising ways that, for example, a photo of Michael Jackson is used in a Flash video; that is, the use of the video game physics engine, like a photo of a celebrity, is used in ludic machinima to create commentary through its juxtaposition with other media.

Technological Determinism and Creativity: Creativity as Primitive Art Management

In multimedia software, the smallest meaningful unit is the art element, which may be a vector line, a sound loop, a video shot, optical effect, a primitive (such as a cube or text box), a layer of a bitmap image, and so forth. Digital creativity involves the composition of such elements in a process in which these elements are created discretely separate from one another but, more importantly, remain discretely separated, no matter how organic the final composition appears. Such a process involves *management* as one of its core skills, and all of the authoring environments contained interfaces—sometimes centralized and sophisticated interfaces—to support management. These interfaces include timelines, layers, and libraries. In some regards, the management of assets as parts of a whole is more important than the individual assets themselves, because it is possible to create a sophisticated message quickly with low production costs (and, of course, low production quality).

This logic of management in multimedia interfaces is greatly facilitated by another seemingly unrelated feature: primitives. While hand-drawing is possible in Flash, it is also laborious. So are custom modeling in 3D, MIDI keyboard- or guitar-playing for GarageBand, and cinematic shooting, pacing, and editing in iMovie. It is often far simpler to obtain an approximation of a compelling design with primitives, which, as long as they are juxtaposed with other primitives, bear meaning capably if not beautifully. The result is meta-commentary and humor, in the sense that Johnson (1997) describes, when he argues that increasingly media is becoming an interface to other media; for example, comedy shows such as *The Daily Show with Jon Stewart* provide a comedic interface through which to watch the news;

likewise, the animated comedy *South Park*[16] offers an interface through which to experience and make sense of popular culture.

One popular genre that demonstrates the use of primitives and management as an approach to "quick and dirty" satirical content is the Flash subgenre of animutation. This genre was created by then-13-year-old Neil Cicierega at an amateur Flash portal called Albino Black Sheep[17]. His original video, "The Japanese Pokerap,"[18] was widely imitated in amateur Flash communities. In addition to imported bitmap graphics and music (in this case, from Pokemon), animutations make significant use of layering, interpolated animation ("tweens"), simple drawing, shape primitives, and mouth cutouts, as can be seen in "Hyakugojyuuichi"[19]. It is hard to imagine the emergence of the animutation—especially in the hands of a 13-year-old—if Flash were not strong at making available visual building blocks quickly and easily or managing them in space and time.

Interestingly, other amateur Flash communities feature Flash movies and games with a distinctly different look. For example, the use of bitmaps, which is dominant at Albino Black Sheep, is comparatively sparse at Newgrounds. Newgrounds features much more vector art, and its music taste tends toward heavy metal, as opposed to Pokemon. Nonetheless, Newgrounds Flash, for all its superficial differences, is produced in more or less the same ways as Albino Black Sheep animation, and it carries many of the same meanings. Specifically, Newgrounds animations often feature complex yet silly juxtapositions of popular media icons, from pop stars to video game heroes, in videos made with conspicuously low production values that rely heavily on primitives carefully managed in space and time. The well-drawn, emotionally serious animation at Newgrounds is the exception, not the rule.

AMATEUR MULTIMEDIA DISCOURSES

Earlier in the paper, I summarized three traditions of theorizing about creativity—HCI, poststructuralism, and technological determinism in media. One of their commonalties was their shared focus on discourse, as opposed to self-expression or the sharing of emotional pleasure. If amateur multimedia is to be considered creative, it must have a discourse. If so, what is the discourse of amateur multimedia?

Clearly, one of its discourses is innovation in the rebalancing of production quality and expense on the one hand and meaning-making on the other. Many professional media producers do not have the luxury to make work with low production quality, because it looks unprofessional. Amateurs have demonstrated in staggeringly diverse ways that low-production quality work can nonetheless bear culturally important meanings, from Numa Numa to All Your Base Are Belong To Us[20], a hugely popular video that inserted a poorly translated English line from a video game dialogue into culturally important images, including street signs, product ads and packaging, Microsoft Windows error messages, political images, driver's licenses, and so on. The core strategy of this phenomenon is the remix, and this aesthetic is encouraged by the technical ways that multimedia software uses art.

A related phenomenon is the development of a certain kind of humor. It is the humor of juxtaposition, parody, and commentary. It deflates the icons of the mass media and subjects them to puerile fun. This discourse has become so powerful that it is making its way into the

mass media. An example of this is the strange story of "Star Wars Kid,"[21] a portly high school student who videotaped himself swinging a stick around at imaginary enemies. His friends posted the tape on the Internet, where it quickly became a meme. Hundreds of others remixed the video, using video compositing to place all sorts of cultural references on the same stage as the fighting student. In the late summer of 2006, Comedy Central's Stephen Colbert[22] fused mass and amateur media, when he shot a segment of himself swinging a stick around, in a clear reference to Star Wars Kid. But Colbert went a step further by shooting the segment in front of a green screen, knowing full well that amateurs would key out the green screen and juxtapose his fighting video with other videos, such as "Stephen Colbert Vs. Rancor."[23] Colbert's use of intertextuality is particularly interesting, because rather than limiting himself to quoting earlier texts (however transgressively), his use of the green screen ensured that he would be quoted in future texts. That is, Colbert tried—and succeeded—to replace Star Wars Kid with himself; YouTube now features dozens of Colbert's "green screen challenge," and he regularly plays them on his show, *The Colbert Report*.

Another way we can see the discourse of amateur multimedia is to see amateur theorizing on amateur multimedia. This can be seen in the meta-amateur multimedia videos one can find on the Internet. These videos promise to show how to create amateur multimedia. Some of them are done with humor—amateur multimedia becomes a part of its own joke. Some are done seriously, with the apparent hope of teaching newcomers how to produce their own media. An example of this phenomenon is Keaton's "Making an Internet Cartoon Tutorial,"[24] available at Albino Black Sheep. This tutorial offers eight prescriptive and self-mocking steps on how to make an animutation, before offering a mock-paradigmatic example of an Internet cartoon (Figure 4).

The logic of computing has altered the ways professionals produce new media, a trend Manovich (2001) has explored already. But it has also altered the ways amateurs produce new media. As the Colbert example (and others, such as the release of a revision of the Newgrounds game *Alien Hominid*[25] on the Xbox, Playstation 2, and GameCube; a new sequel, *Alien Hominid HD,* has also been announced for the Xbox 360) shows, amateur multimedia has entered the mass media mainstream after years of merely causing our e-mail
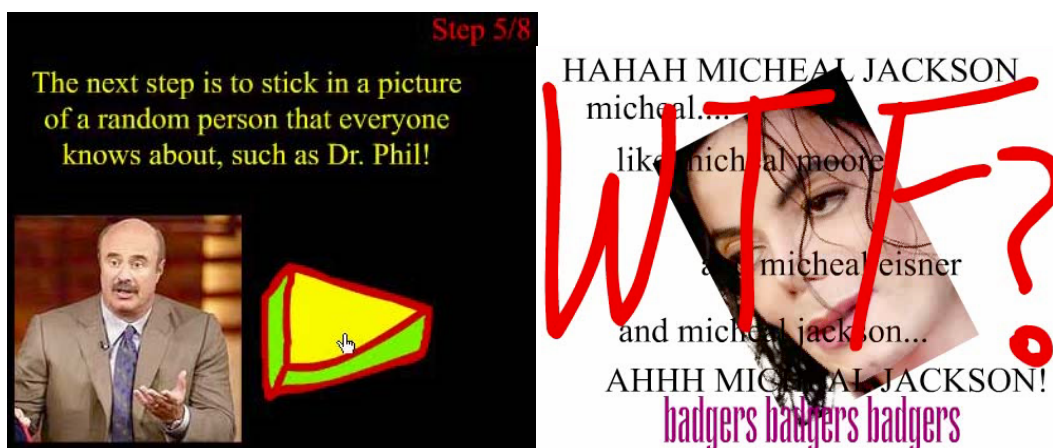

Figure 4. Two frames from Keaton's "Making an Internet Cartoon Tutorial,"
an amateur discourse on amateur multimedia. Used with permission.

inboxes to be filled with "you've got to see this" messages. I have tried to show here that the multimedia authoring tools themselves are built on a shared, implicit language of creativity. This language certainly reconditions the professional artists who use them, but it probably affects amateurs even more. As a result, the interfaces of a handful of software applications have come to make possible and also shape a massive cultural phenomenon.

—————————

ENDNOTES

1. For more information on Newgrounds, see http://www.newgrounds.com/
2. For more information on YouTube, see www.youtube.com/
3. For more information on machinima.com, see www.machinima.com/
4. For more information on Second Life, see http://secondlife.com/
5. The Numa Numa Dance, retrieved December, 22, 2006
from http://www.newgrounds.com/portal/view/206373
6. For more information on Doom, see http://www.idsoftware.com/games/doom/doom-ultimate/
7. For more information on Quake, see http://www.idsoftware.com/games/quake/quake/
8. For more information on Sims2, see http://thesims2.ea.com/
9. To see the first episode of *Red Vs. Blue*, http://www.machinima.com/films.php?id=275
10. Indeed, Manovich singles out Bolter and Grusin's (1999) notion of remediation as failing to account for the new visual language caused by changes in authoring tools.
11. Many YouTube videos have credits that specify the software used. In addition, built-in titles and transitions are often used with their default settings, making them identifiable to the observer.
12. For more information on *The Daily Show*, see http://www.comedycentral.com/shows/the_daily_show
13. For more information on Grouper, see http://www.grouper.com/
14. Retrieved December, 22, 2006, from http://www.youtube.com/watch?v=iJ9zn0Bxoa0
15. Retrieved December 22, 2006, from http://www.machinima.com/films.php?id=204
16. For more information on *South Park*, see http://www.southparkstudios.com/
17. For more information on Albino Black Sheep, see http://albinoblacksheep.com/
18. Retrieved December 22, 2006, from http://www.albinoblacksheep.com/flash/pokerap.php
19. Retrieved December 22, 2006, from http://www.albinoblacksheep.com/flash/pika.php
20. Go to http://allyourbase.planettribes.gamespy.com/video1_view.shtml to see the All Your Base Are Belong to Us video.
21. Go to http://www.ebaumsworld.com/starwarskid.html to see the original Star Wars Kid video.
22. Comedy Central, an American cable television network, can be found at http://www.comedycentral.com/. Its site for Stephen Colbert can be found at http://www.comedycentral.com/shows/the_colbert_report/index.jhtml
23. See, for example, http://www.youtube.com/watch?v=C8Mkm3QtwgE, retrieved December 22, 2006.
24. Retrieved December 22, 2006, from http://www.albinoblacksheep.com/flash/internet.php
25. The original Alien Hominid game can be seen at http://www.newgrounds.com/portal/view/59593. The official site for the console game can be found at http://www.alienhominid.com

REFERENCES

Aarseth, E. (2004). Genre trouble: Narrativism and the art of simulation response; New media as story, performance, and game. In N. Wardrip-Fruin & P. Harrigan (Eds.), *First Person: New Media as Story, Performance, and Game* (pp. 45–55). Cambridge, MA, USA: MIT Press.

Andersen, P. B. (2001). What semiotics can and cannot do for HCI. *Knowledge-Based Systems*, *14*, 419–424.

Annett, J., & Duncan, K. D. (1967). Task analysis and training design. *Occupational Psychology*, *41*, 211–221.

Bardzell J., & Bardzell, S. (2005). Fostering creativity in learning media: Applying insights learned from creative design software. In P. Krommers & G. Rocjards (Eds). *Proceedings of World Conference on Educational Multimedia, Hypermedia, and Telecommunications 2005* (pp. 907–915). Chesapeake, VA, USA: AACE [Association for the Advancement of Computing in Education].

Barthes, R. (1990). *The fashion system* (M. Ward & R. Howard, Trans.). Berkeley, USA: University of California Press. (Original work published in 1967)

Benjamin, W. (1968). The work of art in the age of mechanical reproduction (H. Zohn, Trans.). In H. Arendt (Ed.), *Walter Benjamin: Essays and reflections* (pp. 217–252). New York: Schocken Books. (Original work published in 1936)

Beyer, H., & Holztblatt, K. (1998). *Contextual design: Defining customer-centered systems*. San Francisco: Morgan Kaufmann.

Bolter, J. D., & Grusin, R. (1999). *Remediation: Understanding new media*. Cambridge, MA, USA: MIT Press.

Crawford, C. (2003). *The art of interactive design: A euphonious and illuminating guide to building successful software*. San Francisco: No Starch Press.

Ellul, J. (2003). On the aims of a philosophy of technology. In R. C. Scharff & V. Dusek (Eds.), *Philosophy of technology: The technological condition* (pp. 182–186). Maldon, MA, USA: Blackwell Publishing. (Original work published in 1964)

Ellul, J. (2003). The "Autonomy" of the technological phenomenon. R. C. Scharff & V. Dusek (Eds.), *Philosophy of technology: The technological condition* (pp. 386–397). Maldon, MA, USA: Blackwell Publishing. (Original work published in 1980)

Farooq, U., Carroll, J., & Ganoe, C. (2005). Supporting creativity in distributed scientific communities. *Proceedings of the 2005 International SIGGROUP Conference on Supporting Group Work* (pp. 217–226). New York: ACM Press.

Foucault, M. (2000). What is an author? (J. V. Harari, Trans.). In J. D. Faubion (Ed.), *Michel Foucault: Aesthetics*; *Essential Works of Foucault 1954–1984* (Vol. 2; pp. 205–222). London: Penguin. (Original work published in 1969)

Greene, S. L. (2002). Characteristics of applications that support creativity. *Communications of the ACM*, *45*(10), 100–104.

Johnson, S. (1997). *Interface culture: How new technology transforms the way we create and communicate*. San Francisco: HarperCollins Publishing.

Kuniavsky, M. (2003). *Observing the user experience: A practitioner's guide to user research*. San Francisco: Morgan Kaufmann.

Manovich, L. (2001). *The language of new media*. Cambridge, MA, USA: MIT Press.

Manovich, L. (2006). After Effects, or Velvet Revolution in modern culture, Part 1. Unpublished manuscript, retrieved September 9, 2006, from http://www.manovich.net/

McAfee, N. (2004). *Julia Kristeva*. New York: Routledge.

McLuhan, M. (2003). *Understanding media: The extensions of man; Critical edition* [Monograph], W. T. Gordon (Ed.). Corte Madera, CA, USA: Ginko Press. (Original work published in 1964)

Metz, C. (1974). *Film language: A semiotics of the cinema* (M. Taylor, Trans.). Oxford UK: Oxford University Press. (Original work published in 1971)

Orr, M. (2003). *Intertextuality: Debates and contexts*. Malden, MA, USA: Polity Press.

Paolillo, J., & Bardzell, J. (2005, June). *Humor, multimedia and the Internet: The "Numa Numa" phenomenon.* Paper presented at the International Society of Humor Studies Conference, Youngstown, OH, USA.

Rheingold, H. (2001). An interview with Don Norman. In B. Laurel (Ed.), *The art of human-computer interface design* (pp. 5–10). Boston: Addison-Wesley.

Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. Cambridge, MA, USA: MIT Press.

Saussure, F. (1966). *Course in general linguistics*. C. Bally, A. Sechehaye, & A. Riedlinger (Eds.; W. Baskin, trans.). New York: McGraw Hill. (Original work published in 1915)

Schneiderman, B. (1998). *Designing the user interface: Strategies for effective human-computer interaction* (3rd ed.). Boston: Addison-Wesley.

Schneiderman, B. (2002). Creating creativity: User interfaces for supporting innovation. In J. M. Carroll (Ed.), *Human-computer interaction in the new millennium* (pp. 235–258). Boston: Addison-Wesley.

Schneiderman, B. (2003). *Leonardo's laptop: Human needs and the new computing technologies*. Cambridge, MA, USA: MIT Press.

Sontag, S. (2001). *Against interpretation and other essays*. New York: Picador. (Original work published in 1981)

Author's Note

All correspondence should be addressed to:
Jeffrey Bardzell
Indiana University
1900 E. 10th Street, #938
Bloomington, IN 47406
USA
jbardzel@indiana.edu

AMBIENT ART: CREATIVE INFORMATION REPRESENTATION

Russell Beale
Advanced Interaction Group
School of Computer Science
University of Birmingham, UK

Abstract: *Ambient art is the aesthetic presentation of information, using artistic techniques to achieve a pleasing image that also contains hidden depths, where exposure to it over time allows a viewer to understand something about the information sources that it represents. This paper reviews the artistic and computational background of ambient systems, and presents two case studies of systems developed by our research team, from their initial design to the experiences of the people encountering them. The first case presents a photo mosaic of images based on the news headlines coupled with a structured picture based on the weather; the second presents stylistic perspectives on activity in a public space. Both are evaluated and demonstrate that different forms of aesthetically pleasing displays can convey information to viewers.*

Keywords: *ambient technology, art, case study, public displays, information representation.*

AMBIENT ART: SETTING THE SCENE

In our technologically enhanced modern world it is becoming easier to collect, collate, and represent all sorts of information about our immediate and wider environment, about people, weather, news, and so on. In addition, many approaches exist to visualize this complex, multidimensional information. However, traditional information visualization has not often focused on creating aesthetically pleasing visualizations as a priority: It aims to present abstractions and representations of complex data in a manner that is as easy to understand as possible (Card, Mackinlay, & Shneiderman, 1999), although some beautiful structures have often emerged (Hendley, Drew, Wood, & Beale, 1995). However, most information visualization work assumes that users are paying full attention to the system, not having it exist in the background. Yet people are often in situations in which they want to know only approximately what is happening without having the time or inclination to pay full attention to the details. With ambient art, the focus is not on providing a direct mapping between information and representation, but rather on the creation of a representation of what might

be termed the "mood" of the information. Ambient art can therefore be defined as artwork that provides representations of complex information in an aesthetically pleasing manner. This information can be about the immediate environment, or remote data, or user data, or a combination of these. One of the goals of ambient art is to produce attractive artwork that is meaningful and useful.

An example of an existing system is the ambient orb (ambient, 2006). This product is essentially a desktop lamp that glows with different colors depending on the state of the information that it is monitoring. On the company's Web site, the example is monitoring the state of the stock market, glowing green if stocks are rising through to yellow, and red if they are falling. This primitive example of an ambient information display does raise some interesting points about the advantages of ambient displays. Ambient's site claims "'People want information, but they don't want to invest a lot of time in getting it,' says Ambient president David Rose. 'This makes getting information a "glanceable" thing.'" (final ¶). The ambient orb is interesting because it quickly and accurately communicates simple information to the user. While Hiroshi Ishii's work at the MIT Media Lab focuses on tangible interfaces (Ishii & Ullmer, 1997), he has developed an installation that uses powered versions of children's windmills to represent the state of the stock exchange, thus giving rise to an overall impressionistic conveyance of complex, multidimensional information streams (Dahley, Wisneski, & Ishii, 1998; Wisneski et al., 1998). He also has incorporated the ambient information into architectural spaces (Ishii et al., 1998) This reflection of information in imprecise but aesthetically pleasing forms is also echoed in Weiser & Brown's (1998) work, which illustrates the activity of a network by animating a hanging string as bits pass by on the ethernet cable.

Related work in this area includes the Hello.wall (Prante et al., 2003; Prante, Stenzel, Röcker, Streitz, & Magerkurth, 2004; Streitz, Magerkurth, Prante, & Röcker, 2005; Streitz, Röcker, et al., 2005), in which information is presented to users via a very large public display that uses lights to create patterns. The display looks pretty to the passing visitor but also has meaning to the initiated. Close-up interaction with the Hello.wall is possible by using hand-held devices that communicate with individual cells in the wall. The Hello.wall provides awareness information, and changes according to the people passing by it, making it an informative artwork that uses a simple representation of light patterns in a 2-D array to communicate its message. Heiner, Hudson, & Tanaka (1999) use air bubbles in a collection of tubes in a similar way, to provide environmental information in an aesthetic, peripheral manner. However, these systems focus on producing abstract representations of information using simple displays, and rely on their peripherality and calm nature (Weiser, 1999) as the keys to their aesthetic benefits. The Kimura system (Macintyre et al., 2001) addresses related problems as it tries to present peripheral information to a user in providing an awareness of background tasks and context. The system splits the user's computer desktop into two parts, a central one that contains their current work, and in the other projects peripheral displays that contain montages of images relating to other recent or ongoing activities. This emphasis on contextual awareness is also considered in the work of Matthews, Dey, Mankoff, Carter, & Rattenbury (2004), with their Peripheral Displays toolkit. This toolkit provides structured support for managing user attention through abstracting raw data, providing notification levels to capture the relative importance of different information, and transitions for updating peripheral displays when necessary.

Our[1] approach attempts to focus more on creating representations that are intrinsically artistic rather than simply pleasing, in line with the Kandinsky system (Fogarty, Forlizzi, & Hudson, 2001). The Kandinksky system provides an artistic template that is matched to a series of images based on ambient information, and it has the primary aim of being artistic and aesthetically pleasing, rather than being informative. Redström, Skog, & Hallnäs (2000) also explore elements of the design space of informative art, which they define as computer augmented, amplified artworks that are aesthetically pleasing and yet still convey information, though most of their works focus on aesthetic presentations of one particular information stream.

WHAT IS ART?

Art explores and expresses our aesthetic relation to our environment and ourselves. However, since the rise of photography, the value ascribed to art's representative power has waned. In its place are explorations of the poetics of each piece, the way in which an object's materiality intervenes in the space (and time) in which it is sited, its authorship, the role of the viewer, and so on. These concerns and the opportunities offered by connected, powerful computers and displays offer themselves uniquely to the development of a new medium, an exploration of the way in which ambient information can be represented in a visual format. We are particularly interested in the use of abstract representations to present background information to people. Abstract art is any art form, be it photography, sculpture, or painting, that partially or completely neglects the true form of the subject (Currier Museum of Art, 2005). The artist may choose to represent an everyday object as a collection of lines, colors, or shapes and, in turn, make it completely unrecognizable. Through the medium of abstract art, the artist is better able to represent his or her true thoughts and feelings rather than create a perfect image of the original subject that lacks any underlying emotion or information. It is this abstraction process that makes abstract art perfect for displaying information to a computer user, which they can then interpret consciously or, ideally, subconsciously.

From an art theory perspective, it could be said that the artist is successful in his or her intervention to the extent that s/he manages to engage the viewer's intuition and allows him or her to experience something new. The viewer creates his or her own qualia of experience in the face of any artwork, that is, how s/he feels about the experience when interacting with it. The temporal nature of ambient information means that one has to consider how pieces work over time as well as in the immediate experience. In the case of the artist, there is a physicality to the process of creation that requires the existence of a corresponding temporal component. A piece such as Richard Long's (1986) "Ten Days Walking and Sleeping on Natural Ground" (a text work depicting a walk Long made in Scotland in 1986) has a temporal component that almost outweighs the conceptual. The work is delivered by a fragile skein of text, but its temporal component is present nonetheless. Jackson Pollock's (ArtCyclopedia, 2007a) process-oriented work provided the starting point for much of the movement towards the focus on the performance element of art. Pollock's paintings are more the residue of the art (his act of making) than the art itself.

Acceptable digital 2-D images with an aesthetic that works are not trivial to produce, and digital art that is responsive, slowly transforming, and evocative is taking artistry firmly into

new media territory. The notion of what works is a nebulous one at best: It seems to describe the extent to which the viewer can find coherence between his or her own (intuitive) response to the work and the cultural "ground" from which s/he approaches it. However, there are a number of theories—based on art theory and concepts, as well as sound psychological principles tapping into known emotional responses to color, shape, order, and chaos—to provide researchers with some guiding principles. This type of work has a precedent in the artistic creations of James Turrell (ArtCyclopedia, 2006), although his work was not digital and its interactive element is linked to the physical movement and physiological response of the viewer rather than a feedback process within the work itself. In addition, the novelty of the artifact initially compensates for its potential artistic weaknesses: It can be interesting to see and interact with, but you may not want one in your home for a few years yet.

One of the motivations for our work is to discover whether it is possible to provide effective ambient information to people who can then absorb it without realizing it (Merikle & Joordens, 1997; Merikle, Smilek, & Eastwood, 2001; Rock, Linnett, Grant, & Mack, 1992). One example of this effect is the sound given off by a modem dialing into an Internet service provider: Users are often able to infer the status of the connection by the tone and nature of the sounds produced, without consciously listening to it. In our work, we want to achieve the same by presenting useful information in an understandable yet often abstract and aesthetically appealing manner. One application, thought of as informative art by its developers, produces on a screen in an office a series of blobs that represent the arrival times of the next few buses. The researchers report that users become rapidly adept at understanding the abstract art, and timing their departure from the office based on the state of the image (Skog, Ljungblad, & Holmquist, 2003). While some general analysis suggests that motion is a strong attention-focusing technique (Maglio & Campbell, 2000), and Mankoff et al. (2003) have provided some revised heuristics for the evaluation of ambient displays, the complexities of the relationships between the familiarities of users with systems, the representations, and how those representations change are not yet fully understood.

In the following sections we discuss two experiences of creating and evaluating ambient art systems. In both systems we were interested in whether one can convey meaningful information in an aesthetic manner, trying to produce pleasing images that are also informative.

NEWS MONTAGE

We decided to develop an abstract representation of current news stories. The reason for deciding on news representation was reached from two different perspectives. First, we undertook a small survey with 10 randomly chosen participants in our building (predominantly computer science students); selected results are shown in Tables 1 and 2.

Clearly, news is a commonly accessed resource, and is accessed for a reasonable amount of time a day. These results are supported by other studies (Beale, 2005; Miller, 2003) that show that users regularly monitor news sites for information.

The second perspective came from informal discussions with users about art and ambient art. We repeatedly heard comments relating to representing the news, such as, "It would be possible to have a news input, this would retrieve headline news, text and pictures over a web feed from a site like BBC news[*sic*]" (Shuster, 2004).

Table 1. Information Sources Consulted by Users.

Which of the following types of information do you check regularly? (mark *any* that apply)

Option	Number Of Votes
News (International)	10
News (Local)	9
Weather	6
Email	8
Web site (Please Specify)*	5
Blogs (Please Specify)	2
Other**	1

* Three of the Web sites mentioned were news or newspaper sites, and therefore should have received a vote under news instead. The other two Web sites mentioned were a football team's homepage and eBay.
**The information source mentioned was for stocks and shares in newspapers and on teletext.

Table 2. Temporal Nature of Information Access.

How much time a day to you spend checking the following information?

Option	Less than 5 Minutes	5 to 29 minutes	30 to 60 minutes	Over 60 minutes
News (International)	0	2	6	2
News (Local)	1	1	8	0
Weather	3	7	0	0
Email	3	7	0	0
Web site (Please Specify)*	5	0	3	2
Blogs (Please Specify)	8	0	2	0
Other**	9	0	1	0

* Three of the Web sites mentioned were news or newspaper sites, and therefore should have received a vote under news instead. The other two Web sites mentioned were a football team's homepage and eBay.
**The information source mentioned was for stocks and shares in newspapers and on teletext.

Design

The fundamental concept was to parse a news site for the main stories, to extract keywords from the headlines and story, and then to produce a montage of photographs to represent that story. The concept was that the photographs would change as the headlines change. To retain the abstraction, we did not want to use news photographs as the images, since these tend to be focused on conveying details of the story itself; instead we used a variety of different images that might capture the emotion and mood of the stories.

News Information

The BBC News Web site provides up-to-the-minute news articles. Using the low graphics version of the site, it is possible to see a list of all the latest stories, the first story being the most recent. This information can be accessed through an RSS reader, or by simply parsing the HTML of the site. Figure 1 shows the HTML code of an example news article.

```
<p>
   <a href="/1/low/entertainment/4870150.stm">
   <img height="49" hspace="3"  align="left" vspace="0"
   border="0" width="66" alt="Gnarls Barkley"
   src="http://newsimg.bbc.co.uk/media/images/41497000/jpg/_
   41497940_barkley1_66.jpg"  /></a>
   <a href="/1/low/entertainment/4870150.stm">
      <b>Crazy song makes musical history
      </b>
   </a>
   <br />
   Crazy by Gnarls Barkley becomes the UK's first number one
   single based on download sales alone.
   <br clear="all" />
<p>
```

1   3   2
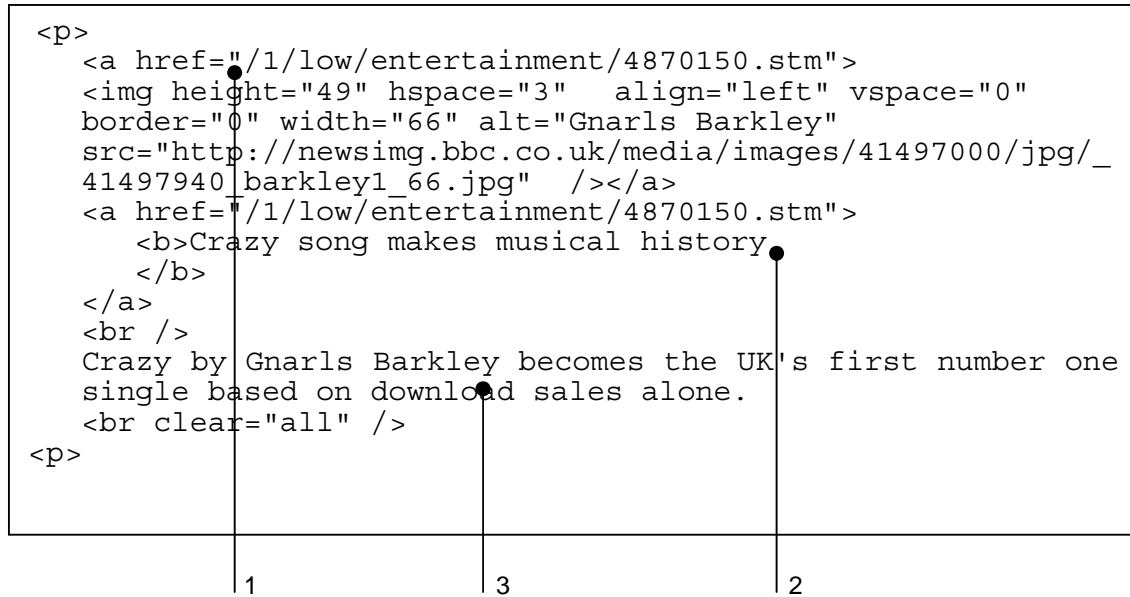
1. By adding the prefix "http://www.bbc.co.uk/news" to this text, a link to the Web page of this news article is created, in this case; http://www.bbc.co.uk/news/1/low/entertainment/4870150.stm.
2. This is the title of the news article.
3. This is the story of the news article.

Figure 1. Elements of the BBC Web site to be parsed.

By parsing the title and story, it is possible to identify useful keywords in the text. We extracted the text, removed the common words, and produced a list of interesting keywords using a probabilistic measure (Beale, 2005).

Pre-Existing Images

In order to use pre-existing images, we needed to find a large collection of images that we could use without fear of copyright restrictions. One such collection is the photograph sharing Web site Flickr (Flickr, 2006). Flickr is a Web 2.0 site, which means it puts a strong emphasis on social networking. One advantage of this is the use of Web 2.0 tags. A tag is a text label that is added to multimedia items on the Internet to add extra information to the item. In the case of Flickr, the tags give an insight into the message that is being communicated by the photographer. These tags not only tell us more information about the photograph, such as the location it was taken and some details about the subject matter, but they also give us an insight into the feelings that the photographer felt when they took the picture. For example, consider the image shown in Figure 2.

The tags associated with this photo are provided by the photographer, and there is no restriction on their content. They are presented as an unordered, unnumbered list in Flickr, but here we have clustered them according to various types: 1 presents descriptions of the subject and the subject area; 2 covers emotions associated with the image; 3 describes the aesthetics of the photo; 4 is a descriptive of the image type; 5 provides geographical information; and 6 provides technical details. The evolution of social tagging is a recent phenomenon, and tags

39

Figure 2. Flickr photograph and selection of associated tags.
Photo © James M. Thorne. Used with permission.

tend to combine both personal expressions and the accepted norms of the domain (e.g., the use of "bw" to indicate a black and white photo) that are acquired by observation and use in that domain. Thus Flickr provides a repository of images that are tagged with both descriptive and emotional content. Together, the tags allow access to images that may reflect the mood of the photograph, rather than just trying to present images that directly match descriptive keyword nouns.

The Flickr site has a search page that allows access to photographs by tags alone or by tag, title, and description. We can parse the resulting page as shown in Figure 3.

```
<p class="StreamList">
    <a href="/photos/james_2005/9469994/" title="Death of
a dandelion">
    <img
src="http://static.flickr.com/5/9469994_df9cb70ab5_t.jpg"
width="100"    height="71" alt="Death of a dandelion" /></a>
    <br>
    From <a href="/photos/james_2005/">THX 1981</a>
</p>
```

1.   2   3   4

1. By adding "http://www.flickr.com" to this text, a link to the photographer's homepage is created, in this example, http://www.flickr.com/photos/james_2005/9469994/
2. This is the photographer's nickname, THX 1981.
3. This is the location of the image: http://static.flickr.com/5/9469994_df9cb70ab5_t.jpg
4. This is the title of the image, "Death of a dandelion."

Figure 3. Flickr HTML parsing.

System Architecture

The system architecture is shown Figure 4. The headlines are taken from the BBC News Web site, and parsed to produce keywords by the news generator. These keywords are transferred to the Flickr site and used to retrieve the best matching images from that site. Photos are chosen on the basis of their match to the keywords, and their popularity on Flickr; thus the images chosen are the result of a social process of tagging and cross-referencing over which no one individual has specific control and which can change over time. The system was configured to retrieve 10 images for each news story, to cover the range of possible emotions and information within the story and to create a more interesting montage. The News Generator communicated with the Picture Information module in order to retrieve sufficient images, and these images were then passed to the Graphics Generator.

While we envisaged producing a mosaic montage as the most artistic output, we wanted to investigate how well the images were able to actually communicate information to observers. So we provided slightly more structured information for evaluation purposes: The 10 images for each news story were presented on the right-hand side of the screen in two rows of five photos, allowing the ability to cycle through three stories at a time. On the top left-hand side of the screen, larger versions of the images were displayed, as shown in Figure 5.

Each set of 10 thumbnails represented one news article. Since different news articles must be quickly and easily distinguished by the user, alternating sets of images were given slightly different background colors. It was also decided to add extra information to each thumbnail: The user could roll the mouse over the image to view a text description of the keyword that the image represents. We added this in response to comments from the early prototype users who were highly confused regarding what the individual images were. The unfamiliarity of the system made it too difficult for them to simply accept the representations as they appeared. They needed to be able to interact with it to discover a little more about the images before they started to understand how the system produced its results. During this prototype testing stage, it also became apparent that users sometimes wished to be supplied with more information than simply the images relating to a news article. We decided that, to increase the acceptability of the system, the user should be able to view more information
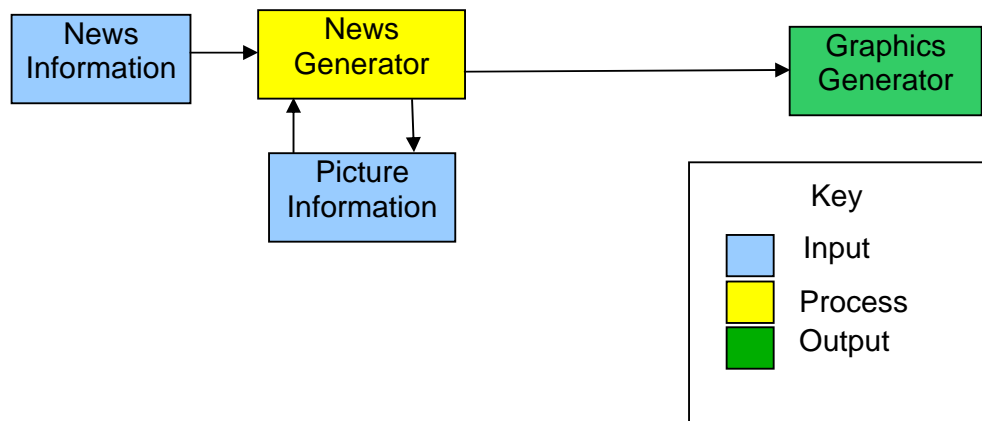

Figure 4. The overall system architecture for news headline art system.

Figure 5. The evaluation version of the news information display[2].

about the story. Therefore if the user clicked the Show button, the system launched a Web browser and navigated to the Web page of the story. Users accessed this function when they were first exposed to the system, allowing them to develop an understanding of the images, but it was used less as time went by.

Further evaluation highlighted that the users sometimes wished to be supplied with more information about the images that were presented. Therefore we included the title and photographer of the selected picture on the screen. Clicking this link navigated them to the photograph's Flickr entry in a browser.

Presenting Weather Information

We also experimented with presenting weather information to the users on the same system by constructing images from basic elements, much like the existing symbolic weather charts. This work bears some resemblance to the InfoCanvas (Miller, 2003; Miller & Stasko, 2001), in which a structured template for artwork was parameterized and populated with images that gave an overall perspective on information, a work subsequently evaluated by (Plaue, Miller, & Stasko, 2004). An example of the symbols used in our project is shown in Figure 6.
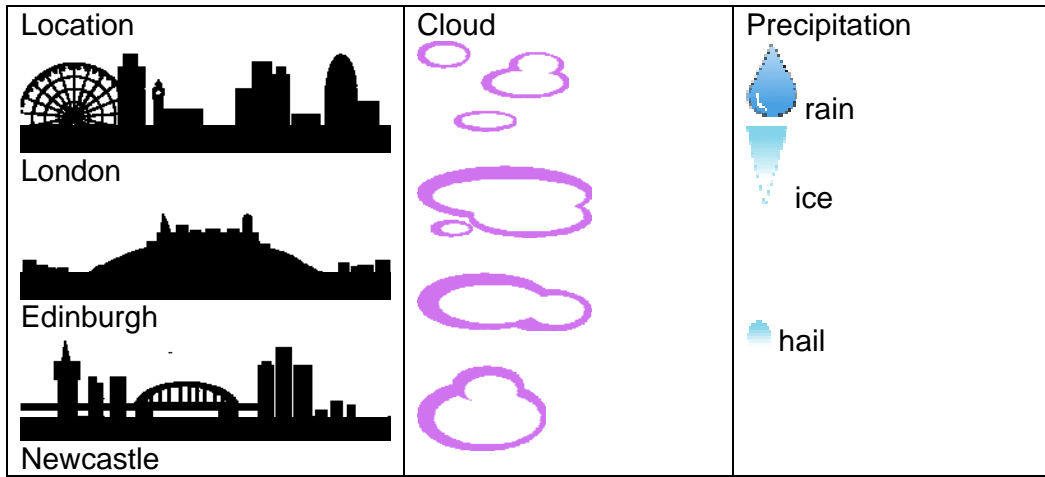
Figure 6. Weather symbols.

The image background was colored appropriately for the time of day, with the appropriate weather elements added to produce images as shown in Figure 7. The data for this was extracted from the METAR Data Access on the U.S. National Weather Service Web site (U.S. Department of Commerce, 2004) on May 12, 2006. Weather information is collected by every airport in the world and published on the Web site every 30 minutes. The information is complex, but is efficiently stored as a single line of text, which can be broken into the sections presented in Table 3.
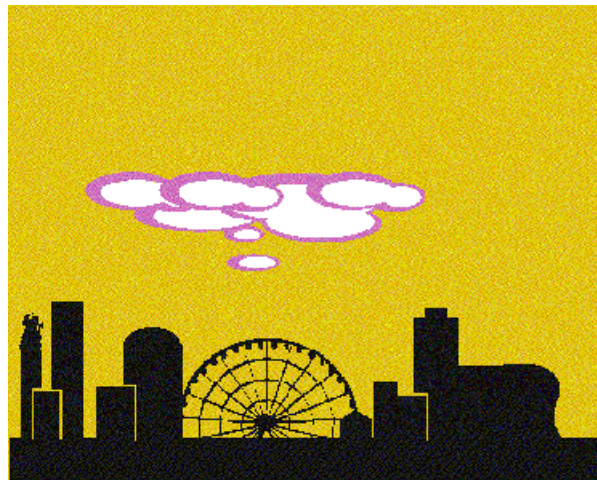
Figure 7. Weather view: early evening in Birmingham, with localized altostratus (mid-level clouds), no precipitation.

Table 3. Sample METAR Data.

ID	TIME	WIND	VIS	WEATHER	SKY	T/DP	ALT	REMARK
EGBB	311850Z	1902G26KT	9999	-SHRA	BKN070	12/08	Q1011	RMK A02

Data retrieved May 12, 2006.

The ID is the identification of the airport at which the weather reading was taken. In this case, EG indicates England and BB indicates Birmingham International Airport. The TIME is the time and date at which the current reading was taken. Readings are taken approximately every 30 minutes, but the information may not be updated if there is no notable difference since the previous reading. The 31 is the day of the month, 18 is the hour of the day, 50 is the number of minutes past the hour and Z indicates the time code that is being used (ZULU or Universal Time Code). The WIND holds information about the wind speed and direction. In this example, 210 is the direction of the wind as a compass bearing between 000 and 360; 11 is the average wind speed; G indicates that there are gusts and 26 is the average gust speed; and KT shows that all speeds are in Knots and indicates the end of the information. VIS holds information about the visible distance in kilometers; 9999 indicates that there are no obscurities, such as fog or smoke. WEATHER holds information about the current weather conditions and obscurations. In this example, the minus symbol (-) indicates light or moderate precipitation, SH represents showers, and RA represents rain. SKY holds information about the clouds above the airport at which the measurements are being taken. BKN represents broken clouds, and 070 represents their height, 7000 feet. T/DP holds information about the current temperature and dew point. Dew point is a measurement of how much moisture is in the air. Both values are in degrees Celsius. ALT holds information about air pressure, in this example it is 1011 hectopascals (hPA). REMARK simply contains information about the weather station.

We parsed this using the same systems architecture as for the news, and presented a simplified picture of the current situation, superimposing the symbols on a stylized image of the location's skyline. The aesthetics of the image are therefore much more predetermined, with the informative content adjusting the presence and positioning of elements in the picture.

Evaluation

Evaluating these systems posed many interesting questions. As informative visualizations, their understandability and expressive power may be important; as pieces of art, these measures are irrelevant because critical analysis and engagement may be key. These systems sit somewhere between the categories of information and of art, and so offer different challenges (Redström et al., 2000). This is also reflected in Mankoff et al.'s (2003) revised heuristic evaluation techniques for ambient art. The aim of any evaluation has to be to gain knowledge about a certain domain, and in our evaluation we focused on users' self-reported perceptions of the system, reflecting their feelings about both its usefulness in conveying information and as a piece of artwork. One key principle for this study was that we wanted to understand their reactions once they had been exposed to the system for a period of time: We were not interested in its immediate understandability or first-glance reaction since we envisaged these systems being used for extended periods of time, existing on the periphery of attention yet being an integral part of the users' everyday environment. Ten users (computer science undergraduate and graduate students, randomly chosen males and females from a variety of cultural backgrounds) were allowed to explore the system for a week.

The system was running continually when the users were at their computers, providing an always-accessible display, which they were at liberty to interact with, or not, as they chose. Participants were, during the study, engaged in quite intensive computing work, and so

were exposed to the system for numerous hours per day. At the end of this time, they were presented with an open-ended questionnaire and their experiences in using the system were examined. A longitudinal study was necessary so that the users could become familiar with the system and begin to learn how the photographs were being selected and presented by the system and so that they could build up a mental model of the sorts of relationships between the information presented and the news items. This was assisted through providing limited interaction possibilities, to either view the news story in detail or to find out more about the photographs that appeared. We did not want users to learn the relationships between particular images and keywords, but instead to begin to pick up on the emotional and aesthetic content of the images, to relate those to the tone of news stories. As with the process of social tagging, we would expect some period of familiarization with the existing tags, images, and social protocols was required before these relationships became better understood.

News System

On a 5-point Likert scale (e.g., Very Good, Good, Average, Bad, Very Bad), users rated the aesthetics of the artwork, with 7 users giving Very Good and 3 Good. Comments made on the questionnaire supported this: "*I saw some really stunning photographs,*" and "*Some of the photographs are really beautiful, while others are a little bit strange….*"

In terms of their comprehension, 7 users found it Average, 2 Hard, and 1 Very Hard to understand the news artwork. However, we can see from their comments that, although initially the system was difficult to understand, they started to learn what it represented "*At first I couldn't understand any of the pictures or what they were meant to symbolise, but then when I looked at the keywords* [by hovering over the thumbnail] *I see the relationship*"; "*Over time I came to recognise certain pictures and remember the keywords that are associated with that picture*"; and "*Although I understand that the pictures represent words from the news, I can rarely understand the news without using viewing* [sic] *the keyword.*"

The results of these questions show partial success in the use of related photographs in creating an impression to communicate information. Impressions are conveyed, but not detailed information, and it takes time for the users to become used to the system and to start to understand the representations used.

Weather System

Aesthetically, this fared less well than the news system. When asked to rate the aesthetics of the artwork, 2 users responded Very Good, 7 Good, and one Average. One user commented, "*It's not as pretty as some of the photographs that are generated, but it does the job.*"

In terms of comprehension, 3 found it Very Easy, 6 Easy, and 1 Average. One user sums up the system with a comment on how easy it was to understand the weather information, "*Very easy,*[sic] *it's not as aesthetically pleasing as the news, but you can instantly see what the weather is like outside.*" This was echoed by another, "*All you have to do is look at the screen and you can see if it's raining outside.*" Another stated, "*It works, but it's not as detailed as the weather that you see on the television,*" reflecting a perspective that the system was principally about communicating information, rather than being viewed primarily as an artwork with the information being of secondary importance.

Aesthetics Versus Information Comprehension

Ninety percent of our users claimed that the weather artwork was easy to understand; unfortunately 30% of the users also claimed that the news artwork was hard to understand. This comes as no surprise, as the weather artwork does provide a more direct mapping between artwork and information. However many users claimed that, over time, they did begin to understand the way in which the pictures were associated with the news keywords, and even began to learn what individual pictures represented. One example of this is shown in Figure 8 (Linny, 2005).

A number of users noticed that that this brightly colored duck was a common feature in the news. They also soon learned that it represented the keyword "UK." Therefore any story that showed this picture was obviously about the United Kingdom. Although this outcome was only achieved through a certain number of exposures to the system, the users all agreed that they had not actively sought to learn the meaning of this picture within the context of the system. A number of users also came to recognize those pictures that represented other common words in the news, such as *war* or *president*.

One user commented, **"*I can definitely see the potential of scanning over a few pictures to see if there is anything that interests you going on, then going to the website for more information*,"** suggesting that the system provides a rapid overview of the news, though this perspective wasn't universal. Another user, who had particular trouble deciphering the news articles, asked why we didn't simply collect pictures from the BBC news site, therefore creating a more accurate depiction of the news: "*Maybe it's just me, but I don't understand the pictures well enough for this to be a useful way of reading the news, maybe if the pictures were more relevant,* [sic] *why didn't you just get the pictures from the BBC website?*"

This comment provoked a serious conversation among the users and researchers during a debrief session about what differentiated artwork from visual information. However, the photography that is presented on the BBC Web site has an emphasis on information, even if it means that the picture itself is not particularly pleasing to the eye. In contrast, our approach focused more on capturing the mood and sentiment in the original subject in order to create a more aesthetically pleasing artwork. It appears from the results of the questionnaire that different users may be susceptible to varying degrees of abstraction, some preferring artwork, while others prefer simple information, such as presented in the weather system.

Figure 8. The Flickr photograph, titled "Mandarin duck in full color," was regularly returned from Flickr as the best match to the keyword UK, based on its Flickr tags and popularity.
Photo © Linda Bingham[3]. Used with permission.

Interestingly, one user compared the system to Makaton, a very simple version of British Sign Language, which the user happens to teach. According to the Makaton website, "Signs are often pictorial and convey the meaning more easily than words, which are more abstract" (Makaton, 2006, ¶4). The user expressed interest in the system and saw the benefits that it would provide for the deaf and dyslexic children that she teaches. This potential use was not originally anticipated, but it is possible that representing information as pictures may have a valuable use in education, aiding disabled users or those who cannot read English.

The images used to represent the latest news headlines were almost exclusively photographs, and they often had a very abstract relationship compared to the article that they represented, whereas the artwork that was created to represent the current weather was more obvious. The weather information lent itself towards more natural artwork; for example, if the weather is cloudy, clouds are shown on screen. The reaction to the weather artwork was more positive from an information sense, as all users were able to quickly interpret it and use the information that they had obtained. However, there was a lot of praise for the aesthetics of the news displays as well. A number of users have continued to use the program after the testing phase finished; they have reported that their knowledge of the meanings of recurring images has improved and therefore it has become easier to interpret the information.

REPRESENTING ACTIVITY

For the second experiment, we created a variant of the system to work with video input, processing the video and transforming it directly into abstractions that became the artwork. The principles behind the system remain the same; however the sensor data are combined and used to create a display that alters with respect to changes in the data streams it receives.

The experiment took place in a foyer of the Computer Science building at the University of Birmingham, UK. We used simple image processing algorithms on video images to track the movement of people around the foyer. An overhead camera captured images of people moving around, showing the people crossing the scene from one side to the other as they moved between rooms or labs, or moving from top to bottom or vice versa, as they entered or left the building, as in Figure 9 (top left). A simple image-tracking algorithm captured these movements (top right). One version of the art server created ghost-like figures that moved across the screen, corresponding to people in the foyer (bottom right). While these images are aesthetically pleasing, they also are very concrete and require attention to discern what is happening.

Extending this approach to produce more abstract art, the tracking output was transformed into either horizontal or vertical lines, based on the average movement of the person. The track of the user was reduced to a single horizontal or vertical line that best approximated their track across the foyer. The midpoint of the persons image from each snapshot was calculated, and the line chosen such that the sum of the absolute distances from each image's midpoint to this line was minimized. These lines were used to create an abstract image, inspired by Mondrian (Artcyclopedia 2007b), in which a rectangular canvas was split by these lines and colored in primary colors. We chose Mondrian since his geometric artistic style has clear parallels with the regular patterns developed in our representation. These images created a correspondence between the movement trails across or through the foyer and the dividing lines in the picture. The image therefore represented the current and recent

Figure 9. (top left) The video camera view of a foyer, composited with snapshots of activity;
(top right) A tracking algorithm identifying the same person crossing the scene;
(bottom right) Temporal ghost output created from the tracked figure.

activity in the foyer: If few people passed by, then very few lines split the picture and it is simple, whereas if the space was busy, then the image is much more segmented too. We did not try to capture the regularity and balance of Mondrian's images, but chose to map the lines into a slightly more meaningful concept (in a representational sense), and then use color to hint at the Mondrian style. The positions of the lines corresponded to the paths taken by the people moving through the foyer, mapped into the horizontal for those crossing the space and vertical for those entering or leaving the building. Images from a placid foyer, with few lines, reflect quite typical Mondrian images, which is less true for images from a busier space. A typical busy image is shown in Figure 10.

Figure 10. Foyer activity represented in a Mondrian-inspired image. Each horizontal line represents a user crossing from left to right or right to left, whilst each vertical line corresponds to a user moving into or out of the building. The cluster of vertical lines on the top left of the image show that more users entered or exited the building around that area than others. Most of the horizontal lines are around the middle third of the image, which shows that most people cross the foyer in the middle.

We evaluated the system over the course of several weeks, using it to demonstrate the technology and concepts to prospective students and parents on open days (days in which the University invites visitors to explore its facilities), and had it running during other periods of time for current students and staff. During the open day, visitors encountered the artwork as they entered the foyer at the start of the day. The artwork was active during their initial coffee and introductory session, and also during the buffet lunch. Visitors attended lectures, tours, and other demonstrations on campus, thereby entering and leaving the foyer three or four times during their time with us. They were given a direct demonstration of the concept after lunch and saw how the images develop over time as more people move around the foyer.

The image was projected onto a white wall around the side of the foyer, or, on another occasion, onto a screen, sized between 2m and 3m across, placed on the floor towards one wall. Evaluation of the system by the prospective students and their parents was informal, consisting of discussions with them about their experiences of the open day in general and the demonstrations they had experienced, of which the ambient art was just one. Approximately 50 people, from a mixture of backgrounds and usually with some interest in computer science, contributed comments to these discussions. They revealed that they found the art interesting and engaging, but that it lacked the aesthetic pleasure that the carefully constructed ratios of the Mondrian images have, and so was not overly pleasant to look at for any period of time.

However, particularly for those people manning the demonstrations, and for staff exposed to the images for longer periods of time, they found that they were able to tell immediately how busy the foyer was, and whether people had recently moved within the building, or had entered or left it. They found that they could interpret general information from the display without actually having to pay it explicit attention. However, this is not to say that these users were completely inattentive, but it reflects that they did not consciously have to examine the image to gain the information they needed.

CONCLUSIONS

In reviewing the concept for abstract aesthetic representations of information, one question that remains open is whether these representations are actually art at all. Some would argue that the aesthetic presentation of information is not sufficient to be called art; others may disagree. We believe that art needs to engage the user's intuition, and that it should allow a person to experience something new. Both of the systems described in this paper achieved this, but in significantly different ways. And certainly this question regarding what constitutes art has been raised not only regarding these systems: Much nonrepresentational artwork is subjected to the same inquiry.

Our studies looked only at the self-reported reactions of users to both the information content and their aesthetic response to the images, since our focus was on exploring the feasibility of creating systems that are primarily artwork, and only secondarily information presentation systems. Clearly, these perspectives limit the conclusions that can be drawn from the studies, and further work is needed to quantify the relationships between information transmission, peripheral attention, and aesthetic presentations.

Our experiences with ambient art demonstrated that it is possible to achieve pleasing representations that reflect ambient information. Users are more easily able to determine the underlying information when a more direct representation (weather images or ghosts walking) is used. Yet, the more abstract, and potentially more "artistic," images are also able to convey information. It also appears that the more indirect representations can provide the more aesthetically pleasing images. In these indirect systems (the news montage and the Mondrian images), the information conveyed was not so directly related to the underlying data streams: It did not attempt to provide an accurate presentation of complex data, but instead appeared to appropriately present an overall mood or impression. When considering ambient art for long-term interactions with such systems, we believe that high aesthetic quality and a broad overview of the underlying information is much more useful to the viewer than more detail in a less appealing representation, as is the ability not to require too much explicit attention. However, it is clear that many users will want to interact with their ambient art, allowing it to provide them with a general impression of the current underlying state of things (whether that be the weather outside, the foyer inside, or the world in general) and then be able to focus in when they become aware of things of interest. It also seems that interaction is important in the initial stages, as the users explore the relationship between the representations and the underlying data, especially in situations such as the news representations that are quite complex. This interaction is important in allowing them to develop an understanding of the system and how it works.

The time scales for the information we are now able to access digitally are widely varied, from the immediacy of current work tasks, the morning's weather, or the day's news, to the longer trends in stock markets, to the very long term, such as the state of a pension fund. These sources need to transmit information to us at differing rates: Knowing when the next bus is due is much more time critical than the overall performance of our investments. While time-critical information can be reflected in the ambient art systems, it requires more direct attention to notice the more rapidly altering information. Requiring less direct attention are the more abstract representations, which also tended to be viewed as more artistic and aesthetically pleasing, but were also were perceived to be less informative. It therefore seems that the rate of change of ambient and peripheral information will be a critical factor in determining the types of display to use. In the systems studied here, we found that longer time-scale phenomena tended to be better received when represented more abstractly, while shorter time-scale and more detailed ones were better when more directly interpretable. As the quantity of information available digitally increases—from, for example, local and remote environment information; the location, activities and moods of our friends; and the status of our many projects and activities—there is a clear need to find the means to represent these varying time scales, these differing levels of detail, to users in ways that go beyond immediate visualization and comprehension.

All of the systems reported here—the news montage, the weather picture, the activity in Mondrian style—are representations of public, nonpersonal information. The first two systems run locally on a user's PC, while the latter one was projected within a public space. On the PC, individual users could delve into the news in more detail, allowing them to follow items of personal interest. However, the public nature of the information allows it to be easily presented to a potentially wider, more diverse audience than could be done ethically with personal details. The issues of privacy and ambient displays have been addressed in different

ways: With the Hello.wall (Prante et al., 2003), users have to be physically proximal to the wall before they can access any more personal information, while InfoCanvas (Miller & Stasko, 2001) uses specific user-defined mappings known only to that user to achieve the relationship between the information and its representation. The issues of displaying private information has not been addressed in this article, but the longer time scales required to become aware of the meanings of information in abstract displays opens up an alternative approach to the personal choices used in InfoCanvas. Since the personal nature of the relationship between the information and the ambient presentation is not obvious to those other than the information owner, and requires long exposure to the display in order to be able to interpret it successfully, the individual user can guide the system towards presenting his or her more personal information in a manner deemed aesthetically pleasing while protecting his or her privacy.

Long-term interaction with such systems may well become very common in the information-rich future. Even today, our attention is ever more divided. Computer systems will be more effective if they can guide us towards monitoring and acting on only that which requires our intervention, while soothing, entertaining and enhancing our environment the rest of the time. We have demonstrated that ambient art can effectively contribute towards this wider goal, though the details of how this is best achieved are only just starting to be addressed.

_____

ENDNOTES

1. Students Kieran Rowley, Jon Shuster, Daniel Witchett, and Louise Fellows worked with the author on a variety of aspects of this research, through their project and summer research work. Theresa Anderson provided input and assistance with some of the artistic aspects. This group of people is referred to as "we" throughout the paper.
2. Photographs used within the Creative Commons License. For more information, see
http://flickr.com/creativecommons
3. See at http://www.flickr.com/photos/linny/

REFERENCES

ambient. (2006). ambient orb: Information at a glance. Retrieved May 14, 2006, from http://www.ambientdevices.com/cat/orb/orborder.html

Artcyclopedia. (2006). James Turrell [American Installation Artist, born in 1943]. Retrieved December 19, 2006, from http://www.artcyclopedia.com/artists/turrell_james.html

Artcyclopedia. (2007a). Jackson Pollock [American Abstract Expressionist Painter, 1912-1956]. Retrieved January 11, 2007, from http://www.artcyclopedia.com/artists/pollock_jackson.html

Artcyclopedia (2007b). Piet Mondrian [Dutch Neo-Plasticist Painter, 1872-1944]. Retrieved January 11, 2007 from http://www.artcyclopedia.com/artists/mondrian_piet.html

Beale, R. (2005). Improving Internet interaction: From theory to practice. [Special Issue] *Journal of the American Society for Information Science and Technology, 57*, 829–833.

Card, S. K., Mackinlay, J. D., & Shneiderman, B. (Eds.). (1999). *Readings in information visualization: Using vision to think* (1st ed.). San Francisco: Morgan Kaufmann.

Currier Museum of Art (2005). Online Curriculum. Retrieved April 6, 2006, from
http://curriculum.currier.org/nh_artists/glossary.html

Dahley, A., Wisneski, C., & Ishii, H. (1998, April). *Water lamp and pinwheels: Ambient projection of digital information into architectural space.* Paper presented at the Summary of the Conference on Human Factors in Computing Systems (CHI '98), Los Angeles, CA, USA.

Flickr. (2006). Retrieved April 6th, 2006, from http://www.flickr.com

Fogarty, J., Forlizzi, J., & Hudson, S. (2001, November). *Aesthetic information collages: Generating decorative displays that contain information.* Paper presented at the UIST '01 [User Interface and Software Technology] symposium, Orlando, FL, USA.

Heiner, J., Hudson, S., & Tanaka, K. (1999, November). *The information percolator: Ambient information display in a decorative object.* Paper presented at the UIST '99 [User Interface and Software Technology] symposium, Asheville, NC, USA.

Hendley, R. J., Drew, N. S., Wood, A. M., & Beale, R. (1995, October). *Narcissus: Visualising information.* Paper presented at the IEEE [Institute of Electrical and Electronic Engineers] InfoVis [Information Visualization] conference, Atlanta, GA, USA.

Ishii, H., & Ullmer, B. (1997, March). *Tangible bits: Towards seamless interfaces between people, bits and atoms.* Paper presented at the Conference on Human Factors in Computing Systems (CHI '97), Atlanta, GA, USA.

Ishii, H., Wisneski, C., Brave, S., Dahley, A., Gorbet, M., Ullmer, B., & Yarin, P. (1998, April). *ambientROOM: Integrating ambient media with architectural space.* Paper presented at the CHI '98 conference on human factors in computing systems, Los Angeles, CA, USA.

Linny. (2005). *Mandarin Duck in Full Colour.* Retrieved July 30, 2006, from http://www.flickr.com/photos/linny/45599281/in/dateposted/

Long, R. (1986). *Ten Days Walking and Sleeping on Natural Ground* [Electronic Version]. Retrieved December 19, 2006 from Tate Online,
http://www.tate.org.uk/servlet/ViewWork?cgroupid=999999961&workid=16604&searchid=10423

Macintyre, B., Mynatt, E., Voida, S., Hansen, K., Tullio, J., & Corso, G. (2001, November). *Support for multitasking and background awareness using interactive peripheral displays.* Paper presented at the UIST '01 [User Interface and Software Technology] symposium, Orlando, FL, USA

Maglio, P., & Campbell, C. (2000, April). *Tradeoffs in displaying peripheral information.* Paper presented at the Conference on Human Factors in Computing Systems (CHI '00), The Hague, The Netherlands..

Makaton. (2006). About Makaton. Retrieved May 14, 2006, from http://www.makaton.org/about/about.htm

Mankoff, J., Dey, A., Hsieh, G., Kientz, J., Lederer, S., & Ames, M. (2003, April). *Heuristic evaluation of ambient displays.* Paper presented at the Conference on Human Factors in Computing Systems (CHI '03), Fort Lauderdale, FL, USA.

Matthews, T., Dey, A., Mankoff, J., Carter, S., & Rattenbury, T. (2004, October). *A toolkit for managing user attention in peripheral displays.* Paper presented at the UIST '04 [User Interface and Software Technology] symposium, Santa Fe, NM, USA.

Merikle, P., & Joordens, S. (1997). Parallels between perception without attention and perception without awareness. *Consciousness and Cognition, 6,* 219–236.

Merikle, P., Smilek, D., & Eastwood, J. (2001). Perception without awareness: Perspectives from cognitive psychology. *Cognition, 79,* 115–134.

Miller, T. (2003). *Understanding awareness information.* In M. Rauterberg, M. Menozzi, & J. Wesson (Eds.), *Human-computer interaction, INTERACT '03* (pp. 673–675). Amsterdam: IOS Press.

Miller, T., & Stasko, J. (2001, March–April). *The InfoCanvas: Information conveyance through personalized, expressive art.* Paper presented at the Conference on Human Factors in Computing Systems (CHI '01), Seattle, WA, USA.

Plaue, C., Miller, T., & Stasko, J. (2004, May). *Is a picture worth a thousand words?: An evaluation of information awareness displays.* Paper presented at the GI '04 [Graphics Interface] conference, London, Ontario, Canada.

Prante, Th., Röcker, C., Streitz, N. A., Stenzel, R., Magerkurth, C., van Alphen, D., & Plewe, D.A. (2003, October). *Hello.Wall: Beyond ambient displays.* Paper presented at the 5th International Conference on Ubiquitous Computing (Ubicomp '03), Seattle, WA, USA.

Prante, T., Stenzel, R., Röcker, C., Streitz, N., & Magerkurth, C. (2004, April). *Ambient agoras: InfoRiver, SIAM, Hello.Wall.* Paper presented at Conference on Human Factors in Computing Systems (CHI '04), Vienna, Austria.

Redström, J., Skog, T., & Hallnäs, L. (2000). Informative art: Using amplified artworks as information displays. In *Proceedings of DARE 2000 on Designing augmented reality environments* (pp. 103-114). Elsinore, Denmark: ACM Press.

Rock, I., Linnett, C., Grant, P., & Mack, A. (1992). Perception without attention: Results of a new method. *Cognitive Psychology, 24,* 502–534.

Shuster, J. (2004). *Ambient art: An implementation of a distributed Web services architecture.* Unpublished project report, School of Computer Science, University of Birmingham.

Skog, T., Ljungblad, S., & Holmquist, L. (2003, October). *Between aesthetics and utility: Designing ambient information visualizations.* Paper presented at the IEEE [Institute of Electrical and Electronic Engineers] Symposium on Information Visualization [INFOVIS], Seattle, WA, USA.

Streitz, N., Magerkurth, C., Prante, T., & Röcker, C. (2005). From information design to experience design: Smart artefacts and the disappearing computer. *interactions, 12*(4), 21–25.

Streitz, N., Röcker, C., Prante, T., van Alphen, D., Stenzel, R., & Magerkurth, C. (2005). Designing smart artifacts for smart environments. *Computer, 38*(3), 41–49.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service. (2004). *METAR Data Access* [Data file]. Available from the Internet Weather Service Web site, http://weather.noaa.gov/weather/metar.shtml

Weiser, M. (1991). The computer for the 21st century. *Scientific American*, *265*(3), 94–104.

Weiser, M & Brown, J. S. (1998). The Coming Age of Calm Technology. In P. J. Denning & R. M. Metcalfe, *Beyond Calculation: The Next Fifty Years of Computing* (pp. 75–86). New York: Springer-Verlag.

Wisneski, C., Ishii, H., Dahley, A., Gorbet, M., Brave, S., Ullmer, B., & Yarin, P. (1998, February). Ambient displays: Turning architectural space into an interface between people and digital information. In *Proceedings of International Workshop on Cooperative Buildings* (CoBuild '98; pp. 22–32), Darmstadt, Germany: Springer Press.

Author's Note

All correspondence should be addressed to:
Russell Beale
Advanced Interaction Group, School of Computer Science
University of Birmingham
Edgbaston, Birmingham B15 2TT
UK
R.Beale@cs.bham.ac.uk

POSTCARDS AND SUPASIGNS:
EXTENDING INTEGRATIONIST THEORY THROUGH THE CREATION OF INTERACTIVE DIGITAL ARTWORKS

Sally Pryor
Faculty of Arts
University of Melbourne, Australia

Abstract: *Integrationism is a post-structuralist theory of language and communication. The theory has been applied to a groundbreaking analysis of writing as a form of communication where writing is teased apart from speech and realigned with spatial configurations in general. Although it has many practical applications, this view can be extremely difficult to comprehend when expressed as a very specific form of writing, that is, as written words on paper. A solution to this problem is offered by the creative interaction design of two digital artworks,* Postcard From Tunis *and* Postcards From Writing. *The works are interactive multimedia pieces that creatively express the integrationist theory of writing and extend it into the transformations of writing that are possible in the human-computer interface. More generally, the unique rollover-based interfaces of these works both express the integrationist theory of communication and suggest that it is necessary in order to explain the creation of communicative signs that they demonstrate are possible.*

Keywords: *writing, integrationism, human-computer interface, rollover, interactive multimedia, digital art.*

INTRODUCTION

The focus in this article is a challenging theory of language and communication called integrationism and its analysis of writing as a form of communication. The intention of this paper is not to argue the validity of integrationist theory, nor to contextualize it within communication in general and semiotics in particular. Rather, the intention here is to briefly outline integrationism's approach to writing and the creative expression of this approach in two interactive multimedia artworks by the author, *Postcard From Tunis*[1] (1997) and *Postcards From Writing*[2] (2004).

As will be seen below, post-structuralist theories of language and communication can be extremely difficult to express as written words on paper. The problem is even more obvious

when applied to an analysis of writing as a form of communication. This paper describes how the two artworks employ creative interaction design to offer new ways to understand difficult theoretical ideas. The interfaces that will be described involve standard human-computer interaction elements: screens, speakers, and mouse movements. Their distinctive characteristic is the creative and highly developed involvement of rollover activities. This paper is thus located at a point of intersection between the creative arts, the humanities, and interaction design.

ARTISTIC BACKGROUND

Tunis is the capital of the North African country of Tunisia (Figure 1). It is well known that the artist Paul Klee was tremendously influenced by a visit to Tunisia. The "light and tonalities" he discovered transformed the way he perceived color, leading him to famously declare in Kairouan (Tunisia) that "Colour and I will always be as one. I am a painter" (Klee, 1914, as cited in Naubert-Riser, 1990, p. 49). In a more modest way, the time I spent living in Tunis in 1992 transformed my own perspective as an artist. In my case, I became powerfully aware of communication, language, and writing. As a result of the hospitality and generosity that I encountered, I began to learn to speak and read Arabic informally. This also enabled me to think about communication, language and writing in new ways, and I wanted to express this artistically. I realized that the emerging art form of interactive multimedia, combined with my ability to program its human-computer interface, offered me a way to express these experiences.

In Tunis I was particularly intrigued by the concept of writing and I began to see it in a new light. This was in part because of my exposure to everyday written Arabic. It was also as a result of the richness of Tunisia's 3,000 years of writing and the traces of ancient scripts and symbols. It seemed to me that there were strong relationships between writing and pictures and important functional differences between writing and speech. I began to search for answers to the apparently simple question, What is writing? Fortuitously, my research in
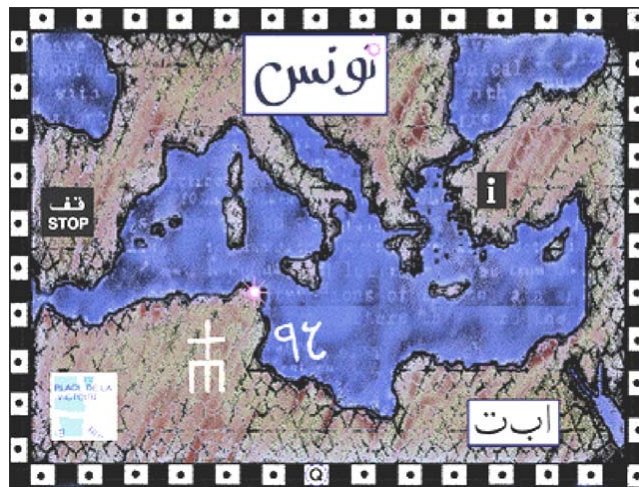

Figure 1. A still from *Postcard From Tunis* with a star indicating the location of Tunis.

Tunis led me to the work of Roy Harris (Harris, 1986), a theorist of writing who offered a groundbreaking explanation of my observations.

WRITING AS A FORM OF COMMUNICATION

Writing about writing is a rather reflexive activity, although this is rarely mentioned. Actually, it is very difficult to think clearly about writing as a form of communication because we live in cultures where written words are usually rather important. In these environments, the traditional view is that *real* writing represents speech (Pryor, 2003). This view is so widespread that it is considered to be common sense and is rarely stated. For example, at a trAce[3] New Media Writing seminar that I attended in 2004, the discussion shifted from writing to written words. However, the term *writing* includes mathematical and musical notation, so it cannot be simply equated with *written words*. Nevertheless, nobody at the seminar appeared to notice that the topic had changed and therefore no mention of the distinction was made.

Why is it so difficult to think about writing as a form of communication without returning somehow to the idea that writing represents speech? Roy Harris (1995) has pointed out a number of reasons. First, most accounts of writing focus on the forms of writing that are linked to speech and marginalize those other forms, such as musical or mathematical writing. In fact it is very hard to think about writing at all and not be influenced by the enormous social, cultural, and political importance of alphabetic writing. However, as Harris has noted, social importance is not the same thing as theoretical importance. In other words, just because one type of writing is culturally dominant does not mean that it is theoretically privileged or that it should be used as the paradigm case.

Second, alphabetic writing is usually considered to be the end product of the development of increasingly sophisticated writing systems, moving from pictures, through picture writing to word writing, and ending with the triumph of the alphabet. However, this idea that the alphabet is the most advanced of all forms of writing is a rather ethnocentric view; that is, it reflects the idea that the culture of one ethnic group, variously labeled *Western* or *European*, is superior to the cultures of other groups.

Third, the simplifying assumptions that are used to teach the alphabet in the West encourage us to think that writing represents speech. However, correlational patterns between letters and sounds are not the same as representational relationships. And lastly, when we think of writing, we are powerfully influenced by the writing space of the printed book. We tend to think that this is the paradigm case of writing when it is actually a very specific form of writing.

The weakness of the "traditional" theory that real writing represents speech becomes most obvious in its analysis of writing that does not represent speech. In these cases, the traditional theory necessitates a search for what these forms of writing *do* represent. The most widely used terms to describe this kind of writing are:
- logograms;
- pictograms (or pictographs); and
- ideograms (or ideographs).

The first term, *logogram*, refers to word-writing, that is, to the representation of a word which will be voiced differently in different languages. An example is the logogram 9, which can be voiced as nine, neuf, and so on. The latter two terms, *pictogram* and *ideogram*, have a variety of definitions (assumed or explicit) that generally link them to pictures and not to speech at all. The most clear-cut definitions are that a pictogram is a simplified picture of the thing represented, and an ideogram represents an idea in general.

However these distinctions quickly break down when actually applied. To study them in practice, we can try to select one of them to analyze the graphic sign at the beginning of the line in Figure 2.
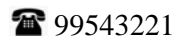
☎ 99543221

Figure 2. An example of communication involving an image that can be classified in various ways: as a logogram, a pictogram, or an ideogram.

Does ☎ represent

- a word: telephone (in English), téléphone (in French), هـاتف (in Arabic), and so on, thus classifying it as a logogram?
- a simplified picture of the thing represented (a somewhat old-fashioned telephone), thus classifying it as a pictogram?
- the idea of telephoning in general, thus classifying it as an ideogram?

There is no satisfactory way to decide whether ☎ is a pictogram, an ideogram, or a logogram because we cannot clearly decide what it represents. However, we do understand what it means and that its proximity to the integers that follow changes the way we interpret them. We know that they do not indicate the number ninety-nine million, five hundred and forty three thousand, two hundred and twenty one, but in fact a sequence of telephone keys to press.

Could we understand writing better by abandoning the idea that writing must *represent* something? This does not seem immediately useful; however the integer 0 provides a practical example. Zero literally represents nothing. However, the difference between the numbers 21 and 201 makes it clear that zero can certainly *mean* something. In the second number, zero's proximity to the integer to its left, that is, 2, has changed the way that we interpret that integer.

Clearly it is possible to understand at least some forms of writing in terms of spatial relationships. To proceed further, we need to change the focus from a view that writing must *represent* something to an understanding of how writing *means* something. We need to begin the analysis with a more general theory of language and human communication. This is the approach taken by Roy Harris, where he argues that *all* forms of writing involve spatial relationships.

THE INTEGRATIONIST VIEW OF WRITING

Harris bases his theory of writing on *integrationism*, a general theory of human communication in all its forms, both linguistic and non-linguistic. Integrationism challenges

existing terminologies and assumptions and proposes a new set of concepts to explain the difference of its approach. This theory of language and communication was originally developed by a group of linguists at the University of Oxford during the 1980s, and the discussion has continued internationally since then. Harris is one of its leading theorists.

Integrationism opposes the segregationist theory that "communication systems (codes) exist autonomously as social facts, independently of their users" (Harris, personal communication, October 20, 2000). Thus according to integrationists, an act of communication cannot presuppose languages (codes) to be already present and available for use; in fact, the opposite is true (Harris, 1998a, p. 5). Language must presuppose communication itself: There can be no language without communication. In the integrationist view, human communication is designed to integrate past, present, and future activities, with time being the primary axis along which these activities are integrated. Human communication is understood, then, as the contextualized integration of activities by means of signs.

More generally for integrationists is the position that although speech is culturally very important, it is not central to any theoretical understanding of how human communication takes place. From an integrationist perspective, human communication has been confused with transport, and language has been confused with the use of tools. Integrationists view human beings as language *makers*, not language users. There are no abstract meanings of language that exist outside of actual contexts, and language is not based on a fixed code that communication participants are sharing. Therefore, a linguistic form is not considered to be an abstract code: It is not an entity with an independent meaning and existence, like a spoon or fork sitting in a virtual cutlery drawer, waiting to be brought out and used.

For integrationists, context is extremely important, not simply in the sense of a setting or backdrop. In contrast, each of us contextualizes in our own way, which is reflected in the common observation that although we may all hear the same words at a particular event, they may mean something different to each of us.

Integrationism is not by any means the sole post-structuralist theory of communication and has not, of course, issued the only challenge to the ways that conventional linguistic theories explain meaning and interpretation as being contained in words or symbols. However, a discussion of the various theoretical approaches in this area is well beyond the scope of this paper and the reader is referred to Harris (1996, 1998a).

Nevertheless, integrationism does involve a major paradigm shift that can make it extremely hard to understand. This difficulty is focused on the term *sign*, which has a very specific meaning for integrationists. Rather than representing something, the integrationist sign integrates activities in a specific context. The meaning of the sign is this integration of activities, rather than being something else that is conveyed or represented *in addition* to the activities integrated. For Harris, "the meaning of a sign is its integrational function—not its capacity to represent anything else" (Harris, 2000a, p. 57) and "a sign cannot exist except in some temporally circumscribed context. That contextualization is an indispensable condition of its very occurrence" (Harris, 1998b, p. 12). An integrationist sign, therefore, cannot be separated into the form of the sign and its content. The sign is a multidimensional construct and it has no meaning separate from an episode of communication.

When Harris applies integrationist theory to an analysis of writing as a form of communication, the cultural importance of written words does not prevent him questioning the

centrality of speech to any understanding of what writing is. And because the integrationist sign integrates activities rather than representing something in addition to the activities, it is also possible to bypass the problem posed by the idea that writing must represent *something*. From this new perspective, Harris points out that the conventional view of writing "confuses the function of the written sign with just one of its possible uses" (Harris, 1995, p. 7). For Harris, writing is a form of communication that utilizes nonkinetic spatial configurations to integrate the biomechanically diverse activities of reading and writing and this "contextualized integration relies in the great majority of cases on a visual framework and visual analogies" (Harris, 2000b, p. 83). Harris argues that a fundamental characteristic of the written sign is that while its formation is kinetic, that is, it involves movement, the written sign itself is static and hence it can be reprocessed, that is, it can be read again and again. In contrast, a spoken sign is a kinetic sign: To hear it again (without using recording technology) we must rely on memory.

Thus, in this view, writing actually has much more in common with pictures than it does with speech because the fundamental nature of writing is based on spatial configurations and relationships. As a result, there are actually no fixed boundaries between writing and pictures at all. Distinguishing between writing and drawing involves studying the macrosocial and biomechanical factors of the activities that are integrated (Harris, 1995, p. 48). Harris does not "seek to arbitrate" the use of the term *writing* as he is more interested in "studying the semiological mechanisms of certain forms of communication" (Harris, 1995, p. 71). However, in distinguishing writing from drawing he has noted that "what characterizes writing is that you have to process the signs in a specific order, not at random" (Harris, 1998a, p. 122).

Harris makes a distinction between the written sign and the written form. The former is not the same as the latter because "different activities of interpretation may confer different significations on the same set of marks" (Harris, 1995, p. 68). This idea is hard to apply to alphabetic writing because our early education encouraged us to think that the question "What does B represent?" has a very simple answer. However the examples in Figure 3 suggest that this B has no abstract invariant meaning that is the same from situation to situation.

More generally, while some forms of writing may well be integrated with speech communication, for Harris these forms do not *represent* speech because we "misconstrue a complex of pedagogically inculcated practices as evidence of a representational relationship between speech and writing" (Harris, 1986, p. 108). This is not to say that writing and speech cannot be closely linked. Harris points out that writing in the Western culture has become specialized over the years to integrate speech communication. Thus a symbiotic relationship has developed between the two: a strong influence both of speech on writing and of writing on speech, and this interrelationship is reflected in changes in both (Harris, 2000b, p. 77). However, this specialized kind of writing must not be made the paradigm case for writing in general because the deployment of graphic forms on a surface can create signs that are unique to writing (Harris, 1995, p. 118). The written sign is not the same kind of sign as the spoken sign and writing is not restricted to the continuum of sound.

	B refers to . . . (assuming macrosocial understandings)
B 🍁	Spoken name of English alphabetic letter
#33B1FF	Hexadecimal (base 16) number (the equivalent of decimal 11)
BATH	Pronunciation guide
☎ 1 800 BUY TV	Telephone key to press
B_2O_3	The element Boron in the Periodic Table
B. My second point is	Numbering system
ℬℬ	Picture (in this context)

Figure 3. These examples show that the graphic form **B** has no abstract invariant meaning.

THE CONTRIBUTION OF *POSTCARD FROM TUNIS*

Harris' view of writing involving nonkinetic spatial configurations integrating biomechanically diverse activities is more apparent when encountering a previously unknown form of writing. My interactive multimedia artwork *Postcard From Tunis* (1997) offers this experience to users who are not Arabic-literate. The work is a personal portrait of Tunis, a city and culture that I love, within which are eight ordinary Arabic words that reflect the themes of the portrait. I programmed the interface so that the work offers users an informal experience of learning to read these Arabic words. Through interaction with the work, a user is offered an experience of the idea that there are no fixed boundaries between writing and pictures (Pryor, 2003).

This experience takes a variety of forms. First, in a number of screens there is a moving cursor that is not controlled by the user. This cursor continually traces written Arabic words

from right to left, starting from the far right-hand side, as shown in a static form in Figure 4 (see also Figure 8).

As discussed above, Harris points out that once a written sign has been formed, it becomes static and it gives no indication of the kinetic process of its formation. Thus, simply looking at a written Arabic sign will not tell a non-Arabic-literate reader the order of its formation. In this program, however, the moving screen cursor gives a clue: In integrationist terms, it traces (and exposes) the order of formation of the static written sign. Thus, what is created through the combination of the kinetic cursor and the static written sign is a new kinetic written sign in which the formation can be reprocessed. This may seem a small point, but it is significant because a fundamental aspect of the written sign has been transformed. This new written sign tells the reader how to start processing it, that is, where to start scanning and in what direction, and it does this without using words.

Postcard From Tunis is multidimensional, combining graphics, photographs, animation, spoken and written words, sound recordings, and music. It is interactive; there are multiple hyperlinked pathways through the material. However, its particular quality is the extensive use of rollovers. A rollover is the activity that occurs when the user moves the mouse (without clicking it) over a programmed area of the screen, resulting in the on-screen movement of the user cursor and a variety of audiovisual responses. Rollovers are rarely mentioned in works on human-computer interaction and are usually overlooked in favor of the hyperlink. However rollovers have a powerful communicational potential. The rollover design in this work enables a gestural and immersive experience for users. As they explore the artwork, they create real-time collages (i.e., layers) and montages (i.e., juxtapositions in time) of sounds, images, and texts. Within this audiovisual experience, the eight Arabic words are interwoven as various combinations of visual and auditory forms.

In the new communication space of *Postcard From Tunis*, the user's integrated activities (looking, listening, and moving and clicking the mouse) create many kinds of signs. The artwork contains a number of active sites such that, when a user rolls over one of them, the following responses are integrated:

- the graphic (image or text) changes visually in some way;
- audio plays, for instance, a spoken Arabic word;
- the background sound track level drops; and
- the cursor changes to indicate whether this location is also clickable.

This rollover functionality is very powerful. Neumark (2000, p. 4) notes that "when sound and image suddenly meet at the moment of the user's interaction, users can experience an intimate engagement and pleasure distinctive to CD-ROM." As each screen has its own background sound composition, a user's rollover movements generate a customized soundtrack made up of these rollover responses montaged and collaged together over the background composition.

Figure 4. Direction of movement of the moving screen cursor in *Postcard From Tunis*

In this work, speech is decentered from its usual dominant position: An auditory sign plays only when the user rolls over a picture or script. For example, rollover on both forms in Figure 5 would transform them visually and trigger the sound [felooka; based on my Australian English phonetics], which also creates a meaningful link between them.

The generic rollover routine varies so that the four components (graphics, audio, background audio adjustment, and cursor changes) are sometimes joined by other responses. In certain screens, additional graphic forms also appear in response to rollovers (see Figure 6) and thus create dynamically reflexive written signs that indicate in writing, but not in words, how the user is to read them.

As an example, upon entering certain screens, an entire written word highlights as the related spoken word plays. Then, one at a time and moving right to left, individual alphabetic letters (or combinations made up of a consonant joined with a long vowel) are visually highlighted (and hence separated from the written word) and the integrated pronunciation plays. At the same time, any vowel marks are displayed and the equivalent individual alphabetic letter(s) appear(s) above the written word. After this sequence, a similar set of activities is integrated whenever a user rolls over any part of the written word, thus creating a dynamically reflexive written sign that indicates how to read it. In the example illustrated in Figure 6, rollover activity on the far right side of the written Arabic word is integrated with seeing that portion of the word highlight and hearing a sound [fff, my phonetics] begin to play. At the same time, a graphic sign appears immediately above it, which is the corresponding alphabetic letter, *Faa*. Subsequent rollover activity on this alphabetic letter is integrated with the spoken name of the letter and a mouse click would take the user to a postcard containing an interactive Arabic alphabet

فلوكه

Figure 5. An example of graphic forms in *Postcard From Tunis* that trigger the same sound through rollover interaction.

Figure 6. A still from *Postcard From Tunis* showing a screen containing dynamically reflexive written signs.

Postcard From Tunis expresses the integrationist view of writing although there is no verbal explanation of this. Neither shape nor sound takes priority in the work. Writing and pictures are presented on equal terms as spatial relationships: complementary facets of one integrated form of communication. Interaction with the work offers non-Arabic-literate users the experience of no fixed boundaries between writing and pictures. The question of what is writing and what is not differs from person to person and from moment to moment, and is always affected by previous and subsequent activities.

As a user interacts with the work, a written Arabic form may appear initially as a pattern of curvy lines (see Figure 7). After further interaction, this pattern may appear to be linked to particular pictures and sounds. Even further interaction reveals that it can be separated into units that are correlated with pronunciations in an ordered manner, that is, it appears to be a form of writing. In this form of writing, the eight ordinary Arabic written words are presented as integrated with speech communication, rather than representing it.

In *Postcard From Tunis*, writing has been transformed from a static to a kinetic and dynamic sign. The artwork contains multiple, interrelated writing spaces. These writing spaces include spaces where the kinetic screen cursor indicates the direction in which a written form should be read, which is something that no ordinary writing does. There are spaces made of multidimensional signs, for example, combinations of static written and kinetic spoken forms. And there are spaces of the dynamically reflexive signs described above: writing that shows the user how to read it without using words.

The integrationist sign allows us to describe the kinds of signs that *Postcard From Tunis* shows can actually be created within the human-computer interface, especially through rollover activities. These signs might be called *supasigns*: combinations of static written signs and kinetic screen cursors (such as the one illustrated in Figure 8), combinations of kinetic auditory and static scriptorial signs, or the dynamically reflexive written sign shown in Figure 6. In fact *Postcard From Tunis* uniquely supports integrationist theory because it demonstrates, in a way that cannot easily be done with words on paper, the idea that meaning is created through the integration of activities. The majority of these supasigns can only be created through the integration of rollover activities; it would be difficult to argue that they can be considered to be signs already created and ready in advance before an actual, material episode of communication. They are multidimensional signs, involving aural and visual forms in multiple combinations. An approach to communication that is based on verbal communication assumes that signs behave like spoken words. Thus, because we cannot speak two words at the same time, we cannot invoke two signs at the same time and can only concatenate them one after the other, as in speech. This dualist model

Figure 7. A written Arabic form in *Postcard From Tunis*

Figure 8. A still from *Postcard From Tunis*.

of the sign cannot describe the kind of multidimensional sign outlined above. What is its form? What is its content? How can these be separated and how can you isolate this sign in time and space? Thus, this kind of sign both expresses an integrationist theory of communication, language and writing and requires the theory in order to explain it.

POSTCARDS FROM WRITING

Postcard From Tunis offers non-Arabic-literate users an experience of the integrationist view of writing via a form of writing that they cannot read. The work does not include any verbal explanations of integrationist theory itself. In contrast, *Postcards From Writing* (2004) offers a great deal of verbal explanation in English and it uses the Roman script, which it is assumed users are quite familiar with. The work is an intellectual "road movie," an interactive journey set in Tunis, Oxford, and Ballarat (Australia), during which I travel to Oxford to interview Professor Harris. The starting point is an investigation of the idea that the concept of "picture writing" might provide a way of thinking about writing within the human-computer interface. As a user moves through the work and learns about integrationism and its approach to writing, it becomes clear that the concept of picture writing has a very weak foundation and that an integrationist semiotics provides a possible alternative.

Like *Postcard From Tunis*, the rationale behind *Postcards From Writing* is creative expression rather than instructional design. Thus, it offers a heuristic exploration of a quite difficult theory and an experience that is as playful, interactive, kinaesthetic, and audiovisually pleasurable as possible. Like *Postcard From Tunis*, this work is multidimensional, combining graphics, photographs, animation, spoken and written words, sound recordings, and music. Like *Postcard From Tunis,* the user creates a collage and montage of sounds and images, leaving graphic traces resulting from user activities. Like *Postcard From Tunis*, the work is interactive: There are multiple hyperlinked pathways through the material. And once again, its particular quality is the extensive use of creatively designed rollover activities. Through interacting with the work, users create a variety of

different supasigns, which, like those in *Postcard From Tunis*, offer an experience of the integrationist view of writing, rather than simply information about it.

Despite being expressed in a familiar script, the work offers users an experience of the view of writing as spatial configurations and of no fixed boundaries existing between writing and pictures. As an animated example of the latter, the screen shown in Figure 9 requires user rollover interaction to order to separate and order alphabetic letters so that they can be interpreted as writing rather than as pictures.

The idea that a written sign is not the same as a written form is offered in Figure 10. Rollover activity on apparently identical forms transforms them into different contextualized signs. Here also, as in a number of other screens, rollover activity can create graphic traces that are not easily classified as writing or picture.
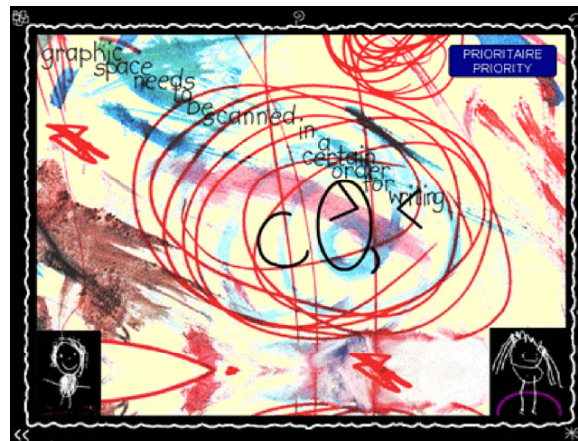

Figure 9. A still from *Postcards From Writing* showing the screen where user rollover interaction separates and orders alphabetic letter forms so that they can be interpreted as writing rather than as pictures.

Figure 10. A still from *Postcards From Writing* that differentiates a written sign from a written form.

In other screens, the role of time in communication is highlighted. Writing fades away as soon as it is written and/or rolled over and is only temporarily refreshed by rollover activity. Overall, the artwork presents a playful explanation of integrationism and writing while, at the same time, informally highlighting (usually through user rollover interaction) the spatiality of writing and its relationships with pictures and speech.

Postcard From Tunis is concentrated on a more structured engagement with written Arabic, which it is assumed the user initially cannot read. This is set within an expressive and personal portrait of Tunis and its ancient scripts and symbols. In contrast, *Postcards From Writing* more loosely and playfully subverts written English, which it is assumed the user can read. The visual style is also playful and features writing and drawing by young children, suggesting a reconsideration of conventions of literacy.

Both interactive artworks are presented as digital postcards because the postcard is a communicational space where writing and pictures have had a more equal relationship and the writer's perspective is personal. Equally importantly, the works are postcards because, as an etiquette tip in 1900 pointed out, "a little card will suggest what we cannot put into words" (Meadows, 1900, cited in Carline, 1971). In other words, as an artist I find that words can often be a clumsy means of expression, and I'm sure many musicians, for example, would agree. Hence I urge readers of this paper to also explore the artworks themselves, in addition to reading what I have to say about them.

SUMMARY

These two interactive works are creative works that offer users an experience of the integrationist theory of writing through creative interaction design involving rollover-based interaction. The works both offer this theory and also require integrationist theory in order to explain the creation of signs that they demonstrate are possible in the human-computer interface. In so doing, these artworks make Harris's groundbreaking and extremely difficult theory of writing more accessible to future practical users, such as those interested in developing new ways to assist dyslexic readers. Here, a conceptual shift from reading as decoding written signs to reading as spatial configurations integrating activities may offer fresh insights into assisting the specific, sometimes space-based challenges of dyslexia. And more generally, the artworks point to future applications of integrationist theory in understanding and innovating in the general field of human-computer interaction. It is here that Harris's prescient remark in 1986 becomes quite relevant: The "origin of writing must be linked to the future of writing in ways that bypass speech altogether" (Harris, 1986, Epilogue p. 158).

––––––––––

ENDNOTES

1. More information and demos of *Postcard from Tunis* are available at http://www.sallypryor.com/tunis.html
2. *Postcards From Writing* is fully available on-line at http://www.sallypryor.com/postcards.html
3. The trAce Online Writing Centre is a leading international center for writers working online. It was based at Nottingham Trent University, UK, 1995-2006, and is now at the University of Bedfordshire, UK.

REFERENCES

Carline, R. (1971). *Pictures in the post.* London: Gordon Fraser.

Harris, R. (1986). *The origin of writing.* London: Duckworth.

Harris, R. (1995). *Signs of writing*. London: Routledge.

Harris, R. (1996). *Signs, language and communication*. London: Routledge.

Harris, R. (1998a). *Introduction to integrational linguistics*. Oxford, UK: Pergamon.

Harris, R. (1998b). Integrational linguistics. In J. Verschueren, J.-O. Östman, J. Blommaert, & C. Bulcaen (Eds.), *Handbook of pragmatics*: *Traditions Update 2000* (pp. 1–14). Amsterdam: Benjamin.

Harris, R. (2000a). Rethinking writing. In S. Covino (Ed.), *La Scrittura Professionale* (pp. 53–61). Rome: Olschki.

Harris, R. (2000b). *Rethinking writing*. London: Athlone.

Naubert-Riser, C. (1990). *Klee: The Masterworks*. London: Bracken.

Neumark, N. (2000). Making contact with artful CD-ROMs. *IEEE Multimedia*, *7*(1), 4–6.

Pryor, S. (2003). *Extending integrationist theory through the creation of a multimedia work of art: Postcard from Tunis*. Unpublished doctoral thesis, University of Western Sydney. Available at http://www.sallypryor.com/thesis.html

All correspondence should be addressed to:
Sally Pryor
Faculty of Arts
University of Melbourne
Melbourne, Australia
www.sallypryor.com

ETHNOGRAPHIC INTERVENTIONS: A STRATEGY AND EXPERIMENTS IN MAPPING SOCIOSPATIAL PRACTICES

Nadia Mounajjed
School of Architecture
University of Sheffield
United Kingdom

Chengzhi Peng
School of Architecture
University of Sheffield
United Kingdom

Stephen Walker
School of Architecture
University of Sheffield
United Kingdom

Abstract: *A growing awareness exists of the possibilities of architectural research adopting working methods used by artists. Many artists have adapted ethnographic methodologies to map site specificity and issues related to community and sociospatial practices. This paper draws on related examples of art practice to formulate a specific research strategy: ethnographic intervention. Ethnographic intervention has three characteristics: (a) ethnographic mapping of spatial practices on site, (b) the possibility of a horizontal replication of the study, and (c) an intervention protocol. We define ethnographic mapping as a critical process directed towards a specific cultural, social, or architectural situation. This involves re-presenting the situation through observing, documenting, videorecording, and photography. We explore the necessity of horizontal replication for producing reliable studies. Finally, we discuss the development of a multi-stage intervention protocol as a creative and flexible instrument, involving design and preparation, data collection, interpretation, and narration. Three case studies illustrate how this strategy has been conceived, applied, and developed at architectural sites. The article concludes with a discussion of the outcomes, usefulness, and possible applications of this strategy in other disciplines.*

Keywords: *ethnographic mapping, sociospatial practices, intervention, interactivity.*

INTRODUCTION

Recently, many calls have been made to embrace interpretation, meaning-in-context, interaction, and the users' experiences in architectural research (Cuff, 1991). Other investigations have considered measuring the quality of space in architecture (Virilio, 1994).

More directly relevant here, Groat and Wang (2002) and Cuff (1991) discuss strategies to understand the dynamics of the profession from the user's perspective and to draw space as people perceive it. Another case in point may be found at Space Syntax (n. d.). Space Syntax focuses on space—the places through which people move and in which social and economic activities are enacted—and the research has resulted in new techniques for describing space and spatial networks. These ideas include ways of representing what people saw as they moved through space, meaning their visual field and lines of sight. The aim was to draw space as people perceive it—to see architecture from the user's perspective. In research, the Space Syntax Laboratory developed methods for analyzing and representing spatial experiences. Spaces were broken down into components, analyzed as networks of choices, and then represented as maps and graphs that described the relative connectivity and integration of those spaces. In a parallel framework, our research also tries to examine spatial experiences in architecture. In this article, we will explore an interdisciplinary method for mapping sociospatial practices in architectural spaces. The discussion will draw on the precedent practices from art, architecture, and social sciences to outline a research strategy.

Architectural studies have often used mapping techniques to explore spatial experiences or as a basis for formulating design guidelines (Lynch, 1960; Lusk, 2002 as cited in Groat & Wang, 2002). Mapping is a research process that allows measuring and evaluating aspects of spatial experiences, such as perception, movement, interactivity, and even memory, especially when these aspects are difficult to analyze through quantitative methods. For instance, Kevin Lynch's (1960) study of *The Image of the City* is a well-known example. Lynch used correlational mapping to examine the way physical characteristics of cities were experienced and understood by ordinary people. In 2002, Ann Lusk also used mapping in her investigation of greenway bicycle paths (as cited in Groat & Wang, 2002, p. 228).

Mapping has proved to be a compliant and evolving technique. It has been used in different research (Susi, 1985; Wall, Karl & Smigiel, 1986). Mapping has even been used in some artistic practices, more specifically in site-specific art installations (McTighe, 2005). Examples include mapping as an approach to site specificity, space as a map, and the unmappable space (Kaye, 2000). More recently, the reassessment of site specificity initiated an original view of artworks and architectural spaces by relating them to social issues and the community, as well as ideas of place and non-place (Kwon, 2004). Some of these art practices were coupled with a quasi-ethnographic way of working (Foster, 1996; McTighe, 2005). A precedent example of an artist/sociologist was Stephen Willats, who was concerned with the social environment of art far more than with the actual work of art. His effort provided examples of artwork that successfully investigated (and modified) the participants' perceptions of coding structures within their environment (Willats, 1976). The result of the artwork was similar to a sociologist's work: A report was written in language appropriate to the language of sociology, involving restricted codes, audience perceptions, predictive language, and social environment parameters.

Some of the precedent mapping and quasi-ethnographic techniques were used to explore aspects of sociospatial practices. Recently, there has been a growing awareness in various disciplines (including architecture) to understand the implications of and correlations between the spatial layout and the users' movements and interactivity. For example, there has been a growing interest in analyzing interactivity and spatial experiences (Haque Design and Research, 2006; Jensen, 1998; McCarthy & Wright 2004). In theory, Jens F. Jensen (1998) categorized the

concept of interactivity into four dimensions: transmissional, consultational, conversational, and registrational. More recently, McCarthy and Wright (2004) investigated interaction design by considering the emotional, intellectual, and sensual aspects of the users' experiences. In architecture, Usman Haque is among a few architects who are working on interactive architecture systems. Haque Design + Research projects involve responsive environments, interactive installations, digital interface devices, and choreographed performances.

In this article, we will try to explore a methodology for mapping sociospatial practices that includes interactivity, particularly in response to some virtual aspects of space and to the relation between virtual and physical. This paper will report mainly on the strategy, rather than the research results. This strategy is called *ethnographic intervention*. It has been used in our research to study the users' spatial experiences in response to specific architectural and virtual conditions (i.e., soundscapes, imagery, interactive video projections). We will start the discussion by demonstrating how the strategy was derived and developed from precedent art practices. We will then discuss the different elements and characteristics of the strategy. In this context, a specific research instrument, which we refer to as the intervention protocol*,* will be explored. After this, we will explain through case studies how the protocol was incorporated in our research. Three interventions will be examined: (a) *Sited Moss: Invading or Fading Architecture*, (b) *Under Scan: Relational Architecture # 11* and (c) *Threshold*[1]. The paper will conclude with a discussion of the outcomes, usefulness, and possible applications of this strategy in the upcoming stages of this research, as well as in other research studies.

ETHNOGRAPHIC INTERVENTIONS

In the 1980s, two separate critical practices simultaneously expanded and touched: installation art and ethnography. This connection turned into a series of "trans-projections between art and ethnography" (Foster, 1996, p. 180). Ethnography first emerged as a medium for major discussions and debates about what was becoming of the social or cultural aspects of life. George Marcus (2003) argues that the prosperity of ethnography depends on the desire for it outside its discipline. At the same time, a distinctive installation practice was growing, a practice that extended institutional critique to explore a broader spectrum of institutions and sites (Meyer, 2006). This crossover between ethnography and installation art sometimes took the form of "ethnographer envy," consuming many of the 1980s and 1990s artists (Foster, 1996, p. 180). Many artists used mapping techniques to highlight situations or sociocultural phenomena. Among such artists are Renée Green, Mark Dion, Fred Wilson, Andrea Fraser, Christian Philipp Muller, and the collective Group Material, who were parts of wider contemporary critical and interrogative practice (Wallis, 1997).

There are many similarities between ethnography and installation art. Both involve studying conditions of human experiences (Bishop, 2002; Denzin, 1997). The two practices are short-lived and characterized by a certain degree of temporal strategy, with ethnography being a temporal experience requiring a certain time for ethnographic immersion, and installation art being a provisional happening (Greverus, Macdonald, Römhild, Welz & Wulff, 2003; Reiss, 1999). This paper does not intend to undertake a discussion of the individual disciplines but is interested in the possibilities of the crossover between the two.

In our research, installations are investigated when they intervene in a particular architectural context to explore correlations between virtuality, spatial layout, and users' behavior. We believe that imagery and soundscapes may affect users' behavior—such as users' activities, interactivity, and sociospatial practices—in the architectural site. In order to investigate this situation, a specific research strategy is conceived and called ethnographic intervention. In this study, the term *intervention* was preferred over *installation* because this latter term has been previously used in an architectural context by scholars when referring to architectural installations (McTighe, 2005; Thompson & Sholette, 2004). Moreover, the concept of intervention (as used in the context of this research) involves more than the artwork: It is not limited to the actual installation but also involves the process of ethnographic mapping and postinstallation research. It is also important to note that this research follows a multi-case study approach, where each intervention represents a case study.

The *ethnographic intervention* involves three main characteristics: (a) an ethnographic mapping of spatial practices on site, (b) the ability for horizontal replication of the study, and (c) an intervention protocol. The following sections will clarify how this strategy has been conceived, applied, and developed to map sociospatial practices in different architectural sites.

ETHNOGRAPHIC MAPPING

In an essay titled "The Artist as Ethnographer*"* Hal Foster (1996, p. 184) introduced and discussed an artistic practice that he defined as *ethnographic mapping.* Ethnographic mapping is a critical practice as well as an intellectual process, a process of highlighting and focusing on a phenomenon within context (social, cultural, or political) then re-presenting it through artistic expression (specifically installation art) for others to experience it. There are different types of mapping: sociological, anthropological, and ethnographic. Foster (1996, p. 184) gave examples of the analogy of social and ethnographic mapping in relation to the "siting" of art. He also explained that *"*mapping in recent art has tended toward the sociological and anthropological, to the point where an ethnographic mapping of an institution or community is [a] primary form of site-specific art today*"* (Foster, 1996, pp. 184–185). In this context, the writer discussed the work of many artists, all working in an analogous way through ethnographic mapping, yet always doing this ethnographic mapping in order to highlight a specific situation in a context or a sociocultural phenomenon.

The process of mapping may take different forms. Regarding mapping memory, McTighe (2005) discussed the work of four artists (Ann Hamilton, Renée Green, Fred Wilson, and Doris Salecdo) as examples of artists who practiced the process of mapping to involve voluntary or involuntary memory, while others practiced sociological mapping. For example, in *Tate Thames Dig* (Tate Online, n.d.-a)*,* Mark Dion was working with art as a social practice by studying found objects in their social (and archeological) contexts. In a process that involved three stages, Dion applied his archeological process to art. First, with local community groups, he undertook an archeological dig on the Foreshore of the Thames River adjacent to the Tate Modern gallery to look for materials left behind on the riverbank. In the course of this process, a wide variety of objects and fragments were uncovered (from plastic toys to shoes). Hence, a profile of the city was built up through its one constant and reason for being: the river. The second phase involved the cleaning and then classification of

finds in archaeologists' tents on the lawn of Tate Gallery. Finally, the objects were represented in a curiosity cabinet in an exhibition space of Tate Modern (Dion, 2000; Tate Online, n.d.-a). Previously, Hal Foster (1996) discussed Dion's practice as an example of artists who use site-specific work for social outreach by "mixing mapping-site with situationist *detournement*" (p. 197–198; italics in original). He introduced Dion's work as a model of some art practices in the 1980s and 1990s. Mark Dion's work may be considered as a model of sociological mapping. It is an example "of the total integration of artistic and social practice*"* (Meyer, 2006, ¶ 8). The process of mapping seems to extend beyond mapping memory and social practice. There is evidence that other types of mapping are still practiced in some contemporary installation works; a good example is Bruce Nauman's series of installations *Mapping the Studio.*

Bruce Nauman's installation *Mapping the Studio II* (Tate Online, n.d.-b) reveals an interesting artwork in which the artist follows a quasi-ethnographic way of working. Actually, *Mapping the Studio II* was the second in a series of installations titled *Mapping the Studio*[2], in which the artist attempts to record, document, and re-present different activities and practices in the space of his studio through the process of mapping. *Mapping the Studio II* (2005) artwork was exhibited in the Tate Modern, London, and consisted of seven video images projected around the gallery walls. Filmed over a period of several months, the footage derived from original material shot by Nauman´s infrared video camera at seven different studio positions. The running time of *Mapping the Studio II* was 5 hours and 45 minutes from each camera location, making a total of over 41 hours.

An interesting aspect of this installation was the margin notes that accompanied the footage. In parallel to the footage projections, the artist presented a series of logbooks recording the process of making his art piece. Those logbooks remind viewers of a notebook made by Nauman for *Mapping the Studio I* in 2002, in which the artist documented the nocturnal activity in his studio of his cat and an infestation of mice during the summer of 2000 (Dia Center for the Arts, 2001). The notebook in *Mapping the Studio I* took the form of Microsoft Word files printed onto A4 paper and displayed on an adjacent wall outside the room exhibiting the pertinent video installation (Manchester, 2005). In a way, the notes resembled an ethnographic narration describing activities in the studio, similar to what a typical ethnographer would write in a diary. Actually, the process recording the notes may be regarded as an ethnographic piece in itself, revealing Nauman's method of working and his role as artist and as ethnographer.

Nauman's (Tate Online, n.d.-b) installation also implied another type of mapping, that of spatial practices within the confines of the studio. The work reflected the artist's attempt to treat and map the conditions of his working space by recording all the happenings that took place in the course of few days. He then edited these happenings and re-presented the work within the Tate Modern exhibition space. If we draw on all the previous mapping practices, we can redefine the process in a better light. In addition to being a measurement process for evaluating spatial experiences, *mapping* can be considered as a critical stance towards specific cultural, social, or architectural conditions. It involves recording, documenting, and re-presenting the implications of a specific condition through video and sound recording, drawings, photography, and so forth. But Nauman was not specifically criticizing a certain condition or an institution; rather he used ethnographic methods to represent the space of the studio. He was not looking for answers but trying to convey a situation. What is important here

is the process: *Mapping the Studio* installations provide additional examples of how both installation and ethnography can be combined in a meaningful way to map spatial experiences.

In addition to the mapping process, Foster examined another characteristic of this quasi-ethnographic art practice, that of horizontal replication of the artwork (Foster, 1996; McTighe, 2005). As we will discuss next, some artists deliberately replicate their artworks through a horizontal shift into different contexts.

HORIZONTAL REPLICATION OF AN INTERVENTION

Hal Foster (1996) proposed a parallel approach to ethnographic mapping. The writer argued that there has been a shift in art practice from vertical to horizontal meaning in a synchronic movement from social issue to social issue. He explained that the horizontal expansion of artistic expression was consistent with the ethnographic turn in art and criticism: "One selects a site, enters its culture and learns its language, conceives and presents a project, only to move to the next site where the cycle is repeated. Second, this shift follows a spatial logic: one not only maps a site but also works in terms of topics, frames, and so on" (Foster, 1996, p. 202). Therefore, we consider this horizontal shift comparable to what is known in academic research as a theoretical replication of case studies (Yin, 1994).

In some of the earlier examples of ethnographic mapping, the knowledge that the artists needed to collect in order to carry out their art practice suggested that they actually approached their artwork from a researcher's point of view. Foster argued that this way of working *"demands that artists and critics be familiar not only with the structure of each culture well enough to map it, but also with its history well enough to narrate it"* (Foster, 1996, p. 202). McTighe (2005) also argued that, by the late 1980s and early 1990s, not only were artists regarded as ethnographers and sociologists but they were also described as being too influenced by theory, too literary, or too "smart" (p. 406). These artists *"extensively researched the context of their work, read heavily in theory and have named the historians and theorists who have been influential in formulating their work"* (McTighe, 2005, p. 406), all of which begs the following question: Can ethnographic mapping and theoretical replication be developed as part of a research strategy?

Both characteristics defined by Foster (1996) are included in this study. In addition to ethnographic mapping, we also draw on this idea of horizontal replication. But we adjust these two characteristics to correspond to our research. This strategy is tested through three successive interventions: *Sited Moss: Fading or Invading Architecture*, *Under Scan: Relational Architecture # 11*, and *Threshold*. As we will explain later, the second and third interventions started to introduce replication in different sites and with different people. However, we will also see that each intervention is an independent case study on its own, involving the actual artwork, ethnographic mapping, and a possible replication.

In each case, the study intervenes physically and virtually in a specific architectural/urban site in order to map memory and sociospatial practices. At the end of each intervention, an interpretative study then reframes the results in relation to the initial thesis investigating the correlation between virtuality and sociospatial experiences. For example, the first intervention (*Sited Moss*) intervened through sounds and mosses in an architectural monument. It focused on the architectural (and symbolic) condition of monumentality and

memory. The second intervention (*Under Scan*) involved the projection of interactive video portraiture in public space. The study then examined social practices in response to this intervention. This work was replicated by the artist in different cities and with different users. As a result, we were able to observe the conditions and implications of the artist's intervention in these different contexts. The final intervention (*Threshold*) was site-specific and explored the conditions of the threshold spaces as an important and symbolic architectural space. It mainly focused on drawing attention to the space through sound projections. The work then examined the change of spatial experiences by mapping movement and interactivity. *Threshold* was also presented twice, hence, allowing for more data gathering and interpretation.

In order to provide more reliability to the study of interventions we developed an intervention protocol. Together with *mapping* and *replication*, the *protocol* is believed to complete the strategy.

THE INTERVENTION PROTOCOL

Recently, some interventionist practices have been adopted to examine sociopolitical issues within context. These actions were often informed by a worldwide tendency to insert the practice of art into the social realm. A few social practices have already used tactics borrowed from art and from a range of visual, spatial, and cultural experiences. Nato Thompson (2004, p. 14) defined the notion of tactics as "a set of tools, like a hammer, a glue gun, or a screwdriver[;] they are means for building and deconstructing a given situation." In our research, we take into account this concept because, in some architectural practices, the researcher needs to have access to a series of tools to record, document, and measure the different conditions of spatial experiences. We are also aware that ethnographic mapping may be enhanced if supported by a mechanism to certify the process and to guarantee some level of reliability and dependability within the study. As a result, we began creating a research instrument called the *intervention protocol*. This protocol consists of a set of procedural steps that act as an agenda for theorizing, mapping, and interpreting the intervention.

Gradually, this protocol developed into a more interesting and useful tool, or actually a toolkit, involving all methods of ethnographic mapping, from observations (with sketches, notes, and drawings) to interviewing, photographing, videorecording, and so on. In a way, this is similar to a bricolage process by which a researcher juggles tactics from different disciplines to produce a creative and reliable (but flexible) tool that one can alter and design according to his/her needs. This toolkit can be designed before the intervention, but also adapted in the field to acknowledge the conditions and specificities of the study. This way, the researcher/designer is well prepared before the intervention. He/she assigns the appropriate methods to use according to each case.

However, the concept of the intervention protocol was not introduced into our research from the very beginning. At the start of our project, the study was thought to be mainly interpretive and the research strategy was not fully conceived. The data collected were still straightforward "audit trails" and the protocol was not conceived in a ready form. It was only later that the two concepts of intervention protocol and ethnographic mapping matured. Even so, a number of ethnographic tactics were used, interpreted, and re-presented in the first

intervention. In the second intervention, the protocol was more defined. In the latest intervention, we made early use of the intervention protocol, and developed it according to the conditions of the study.

The next three sub-sections will explore this further. We will demonstrate how the protocol was employed in each of the three interventions.

Intervention I: *Sited Moss*

The first intervention was initiated, codesigned and installed in collaboration with Rosalie Kim, a PhD candidate at the Bartlett School of Architecture, University College London. Kim works with moss on her architectural design based PhD. The project involved making an installation titled *Sited Moss: Fading or Invading Architecture*, which was exhibited for one day as part of the [Dis]locating Specificity Conference, held September 17, 2004, at the University College London (UCL) [3]. The intervention took place in the Portico at the Main Quad of the UCL campus. As shown in Figure 1, this is an outdoor semipublic space; it forms an important part of the campus' main building. Before and during the installation process, we were constantly reminded of the protected state of the site by the Safety Office and by the UCL Estates and Facilities, who wrote: "The site is a listed building and it is very restrictive regarding any fixings to any part of it" (Colin McClarence, personal communication, July 29, 2004). We also often observed, prior to our intervention, the regular cleaning of all sorts of mosses and the maintenance of any symptoms of decay on the portico. All this stimulated the concept behind the intervention. *Sited Moss* aimed to state that building regulations would not necessarily prevent the portico floor from deterioration. The work also attempted to attenuate the intimidating scale of the portico by highlighting the on-going process of decay (Kim & Mounajjed, n. d.).

Figure 1. *Sited Moss: Invading or Fading Architecture*, UCL, London, 2004. The two images show the site from outside the portico of the main building at the University College London. The external views of the portico reveal the impact that the building has on its visitors. The above images illustrate the size of the columns, the ceiling height, as well as the general scale and position the portico. The site is located on top of the stairs (over 50 steps), making it look like a stage elevated from the surrounding environment.

Throughout the years, continuous happenings and activities have taken place on this site, such as receptions, intimate conversations, displacement of chairs, and graffiti markings by various users. The portico generally collects souvenirs from such happenings. Smells, scratches, textures, and voices reside in the space. Moreover, the weather leaves traces on the building through natural decay. All these conditions make up the memory of the site. So, in this particular work, we decided to trace the Portico's memory by re-presenting hidden aspects from this active site. To start, we focused on the chairs and proposed to keep their location as a distinctive moment in time. Then, we suggested creating a map of mosses on the site, and overlaying it with soundscapes. By placing mosses on the site, we referred to the notion of ruins and questioned the untouchable status of the building. The soundscapes metaphorically suggested previous events (Kim & Mounajjed, n. d.).

First, we used different types of mosses with various colors and textures. Each deteriorated spot on the floor was physically identified with a particular type of moss. The scrapes in the stone were covered with dried-frail sphagnum moss. The punctures were filled with bun/cushion moss, also called *Leucobryum*. And the water channels were mapped with a rich green fern moss called *Thuidium*. Moss emerged naturally as the main material to work with because of its ability to perceive the cracks and gaps within a given surface, to settle in and to develop: The moss served as a decay detector. The moss map covered the whole floor of the portico (an approximate area of 23 m x 9 m). As a result, the work gave an instantaneous reading of the decaying history of the site. One could easily interpret how the portico has been exploited by its users, how the rain water was evacuated from the site, and where the weather mostly affected the space (Kim & Mounajjed, n. d.). Figure 2 illustrates the portico after installing *Sited Moss*.

Figure 2. *Sited Moss: Invading or Fading Architecture*, UCL, London, 2004. The images show the space of the portico with the chairs and the mosses installed. The chairs suggest a previous or potential user.

The mosses were combined with soundscapes. These soundscapes acted on sensors and they could be triggered by users as they moved within the portico. Sounds of breathing, movement, and whispering were projected within the space. The sounds suggested events that the users could not see. The rhythm of breathing, the rhythm of walking, and the rhythm of growing mosses created an ambiguity about the time and the nature of the current experience: Is the soundscape coming "from the growing moss, the users, or the building? Does it suggest the process of a spatial intrusion or the process of a building's decomposition? Is it happening now or is it a memory?" (Kim & Mounajjed, n. d., ¶ 4). In a way, *Sited Moss* aimed to awaken users to the current state of a familiar site, a site so familiar in fact that they used to ignore it, turning their backs to it when looking outwards. The intervention changed the space of the portico and converted the users' behavior from a passive into an exploratory attitude.

Sited Moss was experienced by conference attendees, students and staff from UCL. Most of the people involved in the intervention were regular users of the space, as they used the portico during their lunch breaks. And so their feedback was significant and reliable because they were familiar with the site. We asked some of them about their views on the intervention. Some of them indicated that the intervention changed their perception of the space in some way, whereas the installation remained unnoticed by others. We believe the reason for this is that the mosses and the sounds were originally natural spatial elements from this site; they were thought to be an existing aspect of it.

In this study, the process of ethnographic mapping was not exactly conceived to examine the different activities, practices, and experiences of users in the space of the portico. The aim of the study, then, was to explore the impact of the intervention on those practices. At this stage of research, we were already using ethnographic tactics, such as personal observations, photography, and short interviews to gather data on the site. In this context, the images and observations were used to study users' movements, behaviors, and interactivity. Figure 3 illustrates how observations were collected and drawn to explain patterns of behavior. The observation involved the conditions of spatial experience with and without the installation. Generally, observations and comments confirmed that the installation subtly modified the quality of spatial experience in the portico.

Before the intervention, we noticed that people tended to occupy the space in many different ways. As shown in Figure 4, sometimes the portico's periphery became a shelter or a pavilion, where controlling and monitoring the surrounding activities was possible without inconvenience. The individual activities such as eating, reading, resting, enjoying the sun, and so on, were completed by the contemplation of the nearby environment. However, when these activities were made in couples, the users often looked for a particular spot, an intimate place for private discussion. In groups, usually the users sat on the floor and inhabited the center of the portico, slightly leaning towards the borders in order to catch the sunbeams. When *Sited Moss* was set up in the portico, ethnographic findings showed that the behavior and movement of people was slightly modified. We observed that users gathered close to the source of sound by curiosity and interest, particularly in the zone where different sorts of soundscapes were produced. When they knew that the breathing sounds were not real, they tried to explore the echoes on different locations of the site. Then, users would go back to their original behavior.
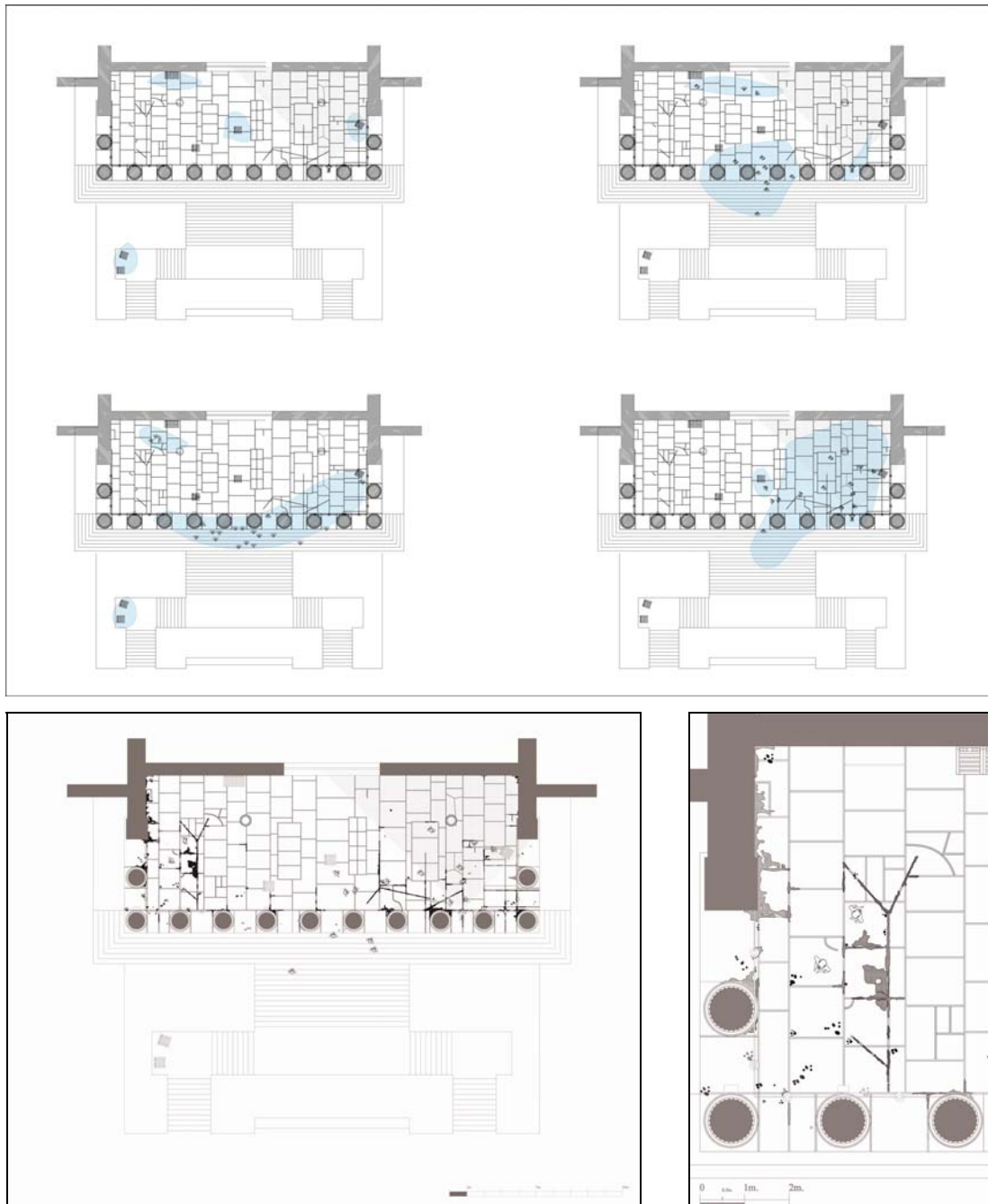
Figure 3. *Sited Moss: Invading or Fading Architecture*, UCL, London, 2004. The images illustrate a mapping process of the users' movements on site. Below left: showing a mapping of the whole space in one moment in time during the intervention. Below right: showing a plan of the western side of the portico with the mosses and participants exploring the space of the Portico. Top: sequence of mapping users' movement on site, the images are arranged from top left corner (anticlockwise); the blue marks represent the areas of users' movement or location: 1) a few users sitting in different spots; 2) conference attendees entering the portico; 3) users exploring the soundscapes in the eastern corner; 4) users walking and looking at the mosses, talking to each other or leaving.

Figure 4. *Sited Moss: Invading or Fading Architecture*, UCL, London, 2004. The images show the users and their different spatial practices in the space of the Portico.

Interviewing was used during the intervention to gather more detailed data about users' feelings, perceptions, and recollected experiences about the space. We were interested to know about the impact of the installation on their spatial experiences. Did they change their behaviour? Did they feel that the space of the portico became more, or less, intimate with the installation? Some of the comments we gathered from users included:

> "*Nice! I didn't realize the mosses at the beginning until you asked me to mind the moss*!"
> "*It looks really natural*."
> "*I got confused because I wasn't sure whether it was always like this or not*."
> "*Very nice*"
> "*Oh, this cleaning staff ― they are so lazy*!"
> "*I really love it and I think it is absolutely beautiful; the seed of a nice project.*"

We noticed three types of reactions from users: the people who immediately saw the mosses, the people who were confused ("*Was it always like this?*"), and the people who did not notice the mosses until we warned them to "mind the moss!" But most importantly, a number of users started to enjoy and pay attention to the site. They made associations with previous or possible future experiences and this imaginative projection proved to be a key aspect of this experience. A discussion with the conference participants was also useful to inform the study because it was focused on the methodology, concept, and techniques behind the creation of the work. The feedback emphasized the nature of the work and the relationship between the different elements of the intervention (the mosses, the soundscapes, the users, and the architectural space).

In terms of the research strategy, the mapping in *Sited Moss* was still an audit trail. The strategy adopted in this study initiated the protocol for the following interventions. The next section will give more detail on this development.

Intervention II: *Under Scan*

The second intervention focused on *Under Scan: Relational Architecture #11*, a large-scale interactive video installation by Mexican-Canadian artist Rafael Lozano-Hemmer[4], which took place in 2005 and 2006. The work was part of a cultural program that took place in five UK cities, involving Derby, Leicester, Lincoln, Northampton and Nottingham. Our study of *Under Scan* focused on the condition of spatial practices in public space, particularly when video images were projected onto a site.

The piece was a large and sophisticated shadow play in which highly complex and powerful projectors cast video into people's shadows in the public space. *Under Scan* created a platform for people to engage in relationships with each other through the representation of *video portraiture* (Mounajjed, in press-a). The installation involved two settings: the video portraiture and an interlude. First, *Under Scan* consisted of video portraits projected onto the floor of public spaces. A thousand portraits were previously filmed for this purpose by local people and artists. As shown in Figure 5, these portraits, activated by the passers-by at 14 changing locations in public spaces[5], were deliberately projected onto the path of the passers. It would lie on the floor waiting for a user to approach it. In a sense, these portraits "took over" users' shadows and the portrait subjects "looked out" at the public.

Technically speaking, video portraits were stored in 14 custom-made media servers that controlled each video sequence. A camera-based tracking system told the main computer where people were walking and predicted the place where they would travel to in the immediate future. The system would then point 14 robotically controlled projectors toward the future locations that would intercept the trajectory of pedestrians, and a sequence of video was projected for them. As a result, 14 different portraits were simultaneously projected over that area – allowing at least 14 individuals to interact at the same time. However, most of the time two or three people would gather around one portrait and start to understand what they were trying to tell them.

Figure 5. An artist rendering of a 3D representation of the project in context: Lincoln in *Under Scan*, Lincoln, 2005. It shows video portraits projected on the ground, inviting users to interact (R. Lozano-Hemmer, personal communication, January 4, 2007; image used with permission).

Under Scan did not involve sound projections. The portraits were mute. However, each of the portrait subjects was trying to do something to stimulate the public (talking, dancing, rowing etc.). In response, people were trying to communicate with the subjects of the video portraits. In Figure 6, one can see examples of a subject in the projected portrait situated on the ground, awaiting interaction. The image shows the portrait subject with eyes diverted from the camera. However, when the user's shadow matches the projected portrait, the portrait is triggered into action by the computer, and the subject looks toward the user. The prerecorded subject then begins a nonverbal gesturing to engage the user, who can reciprocate or react in other ways. When the user walks away from the portrait, the recording is triggered to the point where the subject looks away from the camera, and then the image disappears.

Most people tried to imitate the subjects in the portraits as one explained: *"We have done the rowing with one of the portraits over there! The guy was rowing and I rowed."* Another participant explained her movement in response to the portrait: *"When you are playing with them then you would automatically move your head closer. I was behaving stupidly because I wanted to stand on them. I don't know why but when you see them it just brings out this feeling inside that you want to jump on them. I don't know why"* (Mounajjed, in press-b).

In order to restart and redistribute the portraits, the system periodically needed to stop the projections for a short time. During this switching period, the video portraiture was turned off, the light projectors that created the intense shadows were shut down and a moving grid of lights appeared on the ground. This in-between time was called the interlude. Figure 7 illustrates the interlude setting, which was projected every 7.5 minutes. Initially, the projection of the portraits was intended to be the dominant part of the interaction. Yet surprisingly, the interlude proved to be enjoyable and highly popular with the users. In an interview with Lozano-Hemmer (Mounajjed, in press-a), the artist related this to the fact that the interlude provided a breather or *"a moment when participants could suspend their disbelief or their act of faith."*

In parallel to the projections, a screening of the interaction was displayed on an exhibited small screen. This was deliberately used by the artist as a critique of excessive use of surveillance in public spaces. It also tempted users to stand and look at their interactions through the screen.

Figure 6. *Under Scan*, in Leicester, January 13, 2006. Left: a user walking towards a portrait. The image also shows the screen displayed behind the person. Right: another user is trying to overlap his shadow on the video portrait; the girl in the video is looking at the user and waiting to move.

Figure 7. The *Under Scan* interlude of lights appeared while the portrait system reset itself every 7.5 minutes. This photo was taken in Nottingham, March 10, 2006.

Under Scan was experienced by thousands of people from all ages and classes. The piece was located in different contexts. Figure 8 illustrates *Under Scan* in Lincoln, where the work was sited on the university campus, so most participants were students, staff, and teachers. In Leicester, on the other hand, the intervention was simply projected onto a public square in the center of the city. Most participants were local passers-by from various backgrounds.
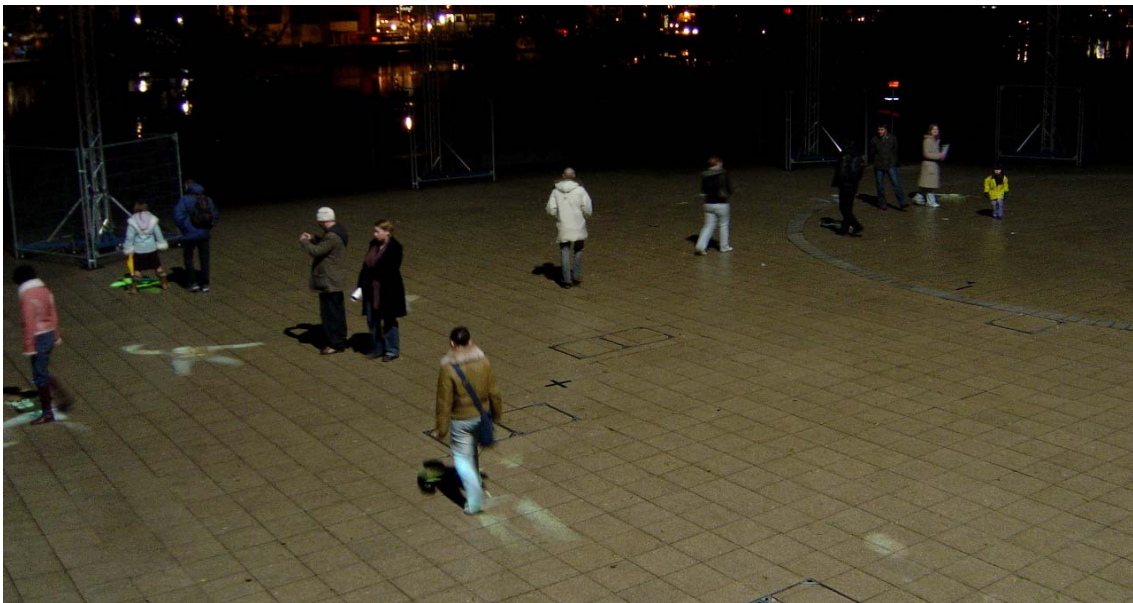

Figure 8. *Under Scan* in Lincoln, December 3, 2005.

We carried out an ethnographic mapping process to study the users' behavior and interactivity in relation to the installation. The mapping process involved recording, documenting, and re-presenting the event. To facilitate this process we devised a specific intervention protocol. This protocol consisted of four phases: a) preparatory stage, b) data collection, c) interpretation, and d) narration and case study re-presentation. Appendix A illustrates the protocol of *Under Scan* at the different stages.

The study started with a preinstallation preparatory stage. This first involved setting up the thesis and research objectives: What was it that we wanted to study? And then it involved developing a case study database that established an agenda for collecting evidence about the site and observing the users' conduct, as well as the site's spatial and material qualities. The database was designed thematically and focused on the following issues: sociospatial practices (interactivity, movement, and social integration), the virtual setting (video portraiture and interlude), and questions regarding memory and time of engagement.

The second phase was data collection, in which four qualitative methods were used: interviewing, observation, photographing, and videorecording. Video footage and personal observation were useful in identifying patterns of behavior and interactivity between the users. Some data about movements were also recorded from the images that were being captured from the surveillance cameras on site and projected on an exhibited screen. Figure 9 shows snippets from the screen with people moving during the intervention. However, the major source of data in *Under Scan* was the interviewing process.

Sixty interviews were undertaken with the artist, technicians, and the general public. Interviews varied in depth and length (from 3 to 30 minutes, whereas the interview with the artist lasted for 50 minutes). We debriefed participants on their experiences. We wanted to know how they responded to, felt about, and interacted with *Under Scan*. More specifically, we were keen to know what they thought of the different virtual settings (i.e., video portraits or interlude) that were projected during the intervention, and if this changed their perception of the original space. Interviews were later transcribed and classified for interpretation in the following stage of the protocol.

Interviewing outcomes conveyed that the *Under Scan* project changed the users' spatial experiences, movements, and social integration in public space. The piece allowed for interactivity in a public space and revealed a social dimension as well. First, we observed that

Figure 9. *Under Scan,* Nottingham; March 10, 2006. Three sequence images where photographed from a monitor for the display of surveillance system. In parallel to the projections, Lozano-Hemmer showed these real images captured from the cameras surveillance in real-time. They are helpful to position users in relation to the portraits. The bright spots on the pavement reflect the video portraits in action; the different silhouettes also reflect people gathering around the portraits or scattered in the space.

the way people moved in the space of the installation was different from the normal movement in public space. This is perhaps due to the fact that the original concept behind the work was centered on the idea of the shadow, which is directly linked to body movement. Moreover, the video portraiture initiated conversations between participants; some were talking with the portrait or about it with others while interacting with it. They played with the different portraits by mimicking the portrait and checking the video subject's response. Many interactions involved multiple portraits and lasted over 15-20 minutes; some participants stayed even longer. Taking into account the fact that the system reset every 7.5 minutes, individuals had to interact with several portraits and with the moving grid of the interval during their 20 minutes experience of *Under Scan*. Many users confirmed that the intervention has changed their perception of the site. For them, the space became *"friendlier," "livelier,"* more *"intimate,"* and *"inviting."* Some regarded the intervention as a conversational piece: bringing people together from different ethnic groups, ages and background, and giving them something to talk about and play with.

The last two stages of the protocol involved interpretation and narration. Appendixes B and C demonstrate how, in this stage, data were compared, organized, and discussed in relation to the research question. In this part of the protocol, the mapping process reported that activities in *Under Scan* depended on the participants' age and on the difference in projection setting between the video portraiture and the interlude. Older people took a contemplative (observer) role, while younger adults and children were more playful and engaged with, and curious about, the piece. Users' behaviors and interactivity changed when the grid was projected during the interval.

More specifically, ethnographic mapping helped us to identify some patterns of behavior and movement sequences within the space of *Under Scan*. For example, during the video portraiture, as the person approached the space, he/she started looking, then shuffling: then stopping, staring, and standing on the portrait; then mimicking the portrait's movements, or talking to others while looking at it. At this point he/she was clearly engaged and became part of the installation. The interlude, on the other hand, offered another type of experience. The participants' behavior switched from a calm/contemplative attitude to a more active and intuitive way of behaving. Users were running with the moving projection and the space suddenly came to life. Furthermore, interview results reported that the interlude provided a more intimate and immersive experience for the users than the video portraiture setting.

What was interesting in the *Under Scan* protocol was that not only did it allow for ethnographic mapping, but it also informed the design of the installation. Artist Rafael Lozano-Hemmer had been concerned with collecting data to improve his artwork. In parallel to our ethnographic mapping, the artist was also on site, observing, interviewing, and recording the participants' views and behaviors. Sometimes, his attitude resembled an ethnographer: When he was on site, he carried his camera, talked to participants, and observed the work. The artist noted that his piece benefits from the data collected. For example, during one interview session, we heard comments from the participants concerning the interactivity of the children with the portraits. The portraits were too big and did not match the size of children's shadows. Such issues were dealt with in the following setup, or they were recorded for future consideration. As a result, the artwork itself was improved and the on-site experience of the users was enhanced. Also during this intervention, we learned that the protocol could be made more flexible to acknowledge the changing conditions and

contexts of the study. For instance, in this case, we had different types of users and contexts. So, we needed to change the protocol accordingly. We changed the questionnaires. We also brought into play the screens that were on site as a data source.

Intervention III: *Threshold*

Threshold[6] was an interactive/site-specific installation. It was located in the eastern wing of the foyer (entrance) in Queen's Building at the Queen Mary University of London. *Threshold* was also a collaborative research project with Dr. Nick Bryan-Kinns from the Queen Mary University of London (QMUL) and Dr. Jennifer Sheridan working in the InfoLab21 at Lancaster University's Department of Computing[7]. The aim of the project was to investigate interactivity in the space of threshold. It also examined the impact of composite soundscapes on the users' spatial practices (i.e., movement and interactivity). The artwork originally was conceived from the concept of a threshold, which is a particularly interesting and composite space: rich, transitory and located between the inside (with its stories and privacies) and the outside/public space (in this case, the city with its disclosure and exposure). Moreover, the notion of threshold is also associated with sensation when defined as the minimal stimulus/energy evoking and producing sensation. A threshold may stimulate different sensations of intimacy, intimidation, nostalgia, or sympathy. Similarly, the *Threshold* intervention was a work that stimulated sensation with visitors. The aim was to create a relational connection and exchange between the users and the architectural site.

In *Threshold,* the research strategy was developed from previous interventions. At this stage, ethnographic mapping was rethought into a whole process of collecting and interpreting the intervention (measurement and assessment). In *Threshold*, we reorganized the protocol into five stages: conception, installation, ethnographic mapping, interpretation, and representation. A sixth step—the horizontal replication—was added later and would repeat the process at either the second or third stage. To start with, we initiated the design of the artwork as an interactive installation. The conception phase led to two parallel design processes: (a) the design and construction of the physical piece, and (b) the design of the interface. And so, the installation consisted of two related elements: (1) a physical structure comprising instrument-like construction of interactive musical chimes, and (2) site-specific sound projections. These two elements were switching or overlapping simultaneously to provide two spatial settings for the users: one imaginary and the other real. An auditory interface was designed to track the users' body sensibilities and movements on site and to switch between the two different settings.

Two types of chimes were used: normal wind chimes and interactive chimes. First, *Threshold* was made of 250 hollow copper pipes (0.15–0.22 mm in diameter) with varying lengths (27–52 cm) providing different tones, all forming together a large instrument. It was located in the eastern corner of the foyer, at one of three entrances to the building. We designed a structure made of wood and a metallic mesh to support the chimes. All chimes were suspended vertically from the supporting structure, inviting people to play with the piece and to create their own tunes. So when a user played with the tubes, the chimes struck each other and produced a harmonic (or inharmonic) spectrum (Mounajjed et. al., 2007). Figure 10 illustrates the conceptual drawings and structural ideas for the piece.

Figure 10. The image illustrates the process of designing and constructing *Threshold*. It shows early plan and section of *Threshold* situated in the foyer. The figure also illustrates the structure of the artwork including: a) planed wood, b)copper chimes, c) a metal mesh and d) a metallic structure.

In addition, the piece contained three interactive chimes. These were made of copper tubes (9.5 mm in diameter and 31cm long) but they contained sensors. The interactive chimes were bigger than the wind chimes and were embedded in the piece. Each one of the three interactive chimes enclosed a small, hidden computer with attached sensors, which would sense the movement of people and consequently send signals to project ambient soundscapes on the space (Mounajjed et. al., 2007). Figure 11 demonstrates the relationship between the sensors and the computers.

Following the design stage, we worked on the *installation* phase. This involved several realization stages from the making to the testing and the final set-up of the piece with the interface. When installed, *Threshold* was sensitive to movement. This movement stimulated the interactive chimes (embedded in the piece) to project recorded audio clips. These clips highlighted the history of the site and the memory of Queen's Building. The first track projected a reading from Walter Besant's best-seller novel *All Sorts of Conditions of Men: An Impossible Story* (1882). The relevance of the novel to Queen Mary lies in the novel's description of the "Palace of Delight," which we believe is very similar to the design of the People's Palace (the original building of Queen Mary College). More than a century ago, the People's Palace was standing on the same site (where the installation was set up) before it was destroyed in 1892. The second recorded audio clips contained a May 14, 1887 speech from the Prince of Wales at the opening ceremony of the Queen's Hall. The third chime projected another fragment about the story of the Queen's building. All these recordings were conceived, recorded and projected to create a spatial narrative for the users as they play with the installation.

Before the intervention, we believe the foyer had started to lose its spatial meaning for users and became simply a passage to other locales. We observed users as they walked by; they seem to have lost the sense of space in the foyer. In this context, the installation of *Threshold* acted as a site of exchange and interaction to re-engage visitors with the space of the foyer. It allowed people to establish a relational connection with the place through memories, narratives, and stories. The aim was also to examine if people would change their behavior in response to the stories or would interact and navigate differently in response to the spatial/audio narrative. In order to understand the stories, users had to sustain their interaction with the piece. However, the users were also free to imagine, create, and link their

11a

11b
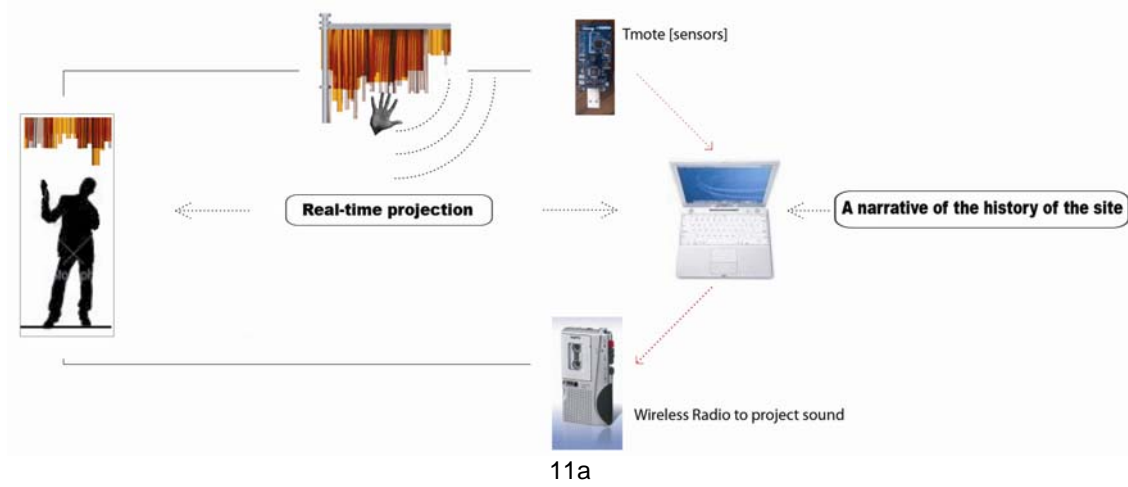
Figures 11a and b. The architecture illustrated in figures 11a and 11b was mainly designed and installed by Jennifer Sheridan and Nick Bryan-Kinn. As shown in figure 11a, it consisted of Tmote Invent artifacts installed in three of the chimes. These were programmed using TinyOS to send tilt information wirelessly to a central laptop located in a room next to the installation. When the motion of a person (or a breeze) was detected in a Tmote, the laptop triggered the playback of an associated audio track; when there was no interaction or wind, the associated playback was paused. Audio was wirelessly transmitted to these sensor chimes via three separate audio channels from the laptop PC. We used Max/MSP to control the sound without any noticeable lag in interaction. Figure 11b illustrates the actual laptop PC (left of image) and multichannel audio setup (right of image) used to drive the soundscape from the adjacent room (Mounajjed et al., 2007).

own narratives. After the installation, people began playing with the chimes, and listening to stories through their interactions with *Threshold*. These interactions were ethnographically mapped for analysis.

In order to investigate the further impact of *Threshold* on users' spatial experience, we documented and analyzed these interactions. This involved an on-site ethnographic mapping of the work in order to collect data and represent the users' experiences of the installation. It involved a set of methods including observation, video recording, interviews, and audio recording. During the exhibition period, we were recording notes and sketches in relation to

users' behavior. Fifteen short interviews, with randomly selected users, were also conducted to explore the users' views and expressions in response to the work.

Threshold attracted all sorts of participants, such as students, staff, conference participants, and university visitors. Some of the participants were dancers, performers and researchers. The resulting interactions with the installation were very interesting. For example, a dancer started to dance while playing with the chimes, and there were others who came in a group to play and interact with the chimes. As shown in Figure 12, the artwork kept visitors entertained and enhanced their spatial experience.

After two exhibitions, all data was organized for the next stage: the *interpretation* stage. In this stage, we analyzed the data that resulted from the observations, interviews, and video recordings. The audio recordings and interviews were evaluated to explore the individual experiences of participants. Observation notes were examined to infer data on movement and behavior. We also followed a similar (but simplified) approach to analyzing the interaction as that developed by Heath and Hindmarsh (2002), who examined video footage to study patterns of behavior and the integration of the users within gallery spaces. Figure 13 shows how we extracted sequences from the footage; these were later identified to trace the interactivity of one or two persons interacting with the piece.

We think that *Threshold* has changed the users' experience of the foyer space in a certain way. Initial findings indicate that the *Threshold* installation invited interactivity and exchange between the users and the foyer. Generally, the piece formed a stimulating entry to space and informed the users about the memory of the building. Also, the artwork kept users entertained and enhanced their spatial experience. Most users reported that the installation was engaging and that it had changed the space. Since this is still work in progress, no clear patterns or sequences of movements have yet been identified. However, we observed many visitors coming close to the piece, playing with it, and listening to the stories. Interestingly, some people were more intuitive in initiating interactions; others were more careful and slow in their

Figure 12. The installed *Threshold* being experience by users in the entrance space of the Foyer at the Queen Mary University London, September 2006.

Figure 13. Images taken from the footage and showing *Threshold*'s second installation in the Foyer in QMUL on September 12, 2006. The images present the piece while being experienced by conference participants. Along with other sequences, this example was used in analyzing and mapping users experience in the *Threshold* space.

interaction. On the other hand, there were few points that emerged from talking to users. The first issue was raised in relation to the conflict between natural soundscapes and sound projections. One person commented that he felt a clash between the sounds of chimes and the audio and this somehow hindered his experience. A woman told us that the projected speech was not always clear and that the sounds were fuzzy and overlapped with the natural soundscapes of the wind chimes. In this particular stage of the project, the chimes were not specifically laid out to produce a harmonic spectrum: It was not musically tuned. The aim was to leave space for imagination and creativity; however, this point is worth consideration.

Another related issue was also involved the "plot" of the audio projections and their interrelationships. Three users could not fully understand the relationship between the different clips. However, the intention of the installation was to create this confusion to enable the users to extend their own imaginative space on the physical space. Part of the work also aimed to observe links between spatial and narrative maps in the space of *Threshold*. This relationship may be explored and emphasized in future development of the work. It will be also interesting to explore the piece in different contexts. For example, the project may be developed and set up to be experienced by children. *Threshold* is a flexible structure. The content of the sounds could be developed to stimulate the children's imagination and the piece can be changed to fit the children's bodies. Children are more intuitive and they are generally fascinated by narratives. It would be interesting to see how they would interact with the piece.

Development of the Intervention Protocol

The three interventions, discussed above, convey a general framework for the intervention protocol but do not dictate one. However, we believe that the most recent version of the protocol—comprising the five stages of conception, installation, ethnographic mapping, interpretation and representation, with the possibility of including the sixth stage of replication—is the most ideal and applicable for the time being.

For future research, the protocol can be manipulated and reproduced according to the specificity of the inquiry, particularly when it comes to interpreting and theorizing the intervention. Finally, it must be noted that the intervention protocol should be envisioned as an essential part of the intervention. It must acknowledge the nature of the architectural site (entrance, indoor, outdoor), the context (social, cultural, and sometimes political), as well as the nature of the users (children, adults, students, dancers).

OUTCOMES, CONCLUSIONS, AND FURTHER STUDY

In the three case studies, ethnographic findings indicated a correlation between the interventions and sociospatial activities. The three installations aimed to recondition or overlay the site. As a result, they transformed the users' perceptual and spatial experiences. In *Sited Moss,* the findings demonstrate that the installation affected the spatial experience of the users. Results also reported that, at some point, the soundscapes implied a certain sequence of movement within the space of the portico. In *Under Scan*, the findings were clearer: The intervention radically changed the users' experience and sociospatial practices. People developed a pattern of movement in relation to the different settings of the installation. Finally, initial outcomes from the *Threshold* project also point to a possible relationship between the users' interactivity with the space and the intervention.

The ethnographic intervention strategy used in this study was mostly empirical. It was a combined strategy, bringing together ethnography and installation. This depended on three main characteristics: (a) ethnographic mapping, (b) horizontal replication, and (c) the intervention protocol. Ethnographic mapping provided a framework for analyzing aspects of the users' spatial experiences. On the other hand, horizontal replication, and the intervention protocol, provided a logical and objective framework for data collection, as well as interpreting and narrating the significant findings in the data. During this research, we generally found that interviewing was particularly useful to define specific patterns in individual experiences (subjective, memorial, and perceptual experiences). The video recording and the observations were useful in exploring sequences of movements, patterns in the interactivity and social effects. Since it was difficult to capture all these elements through sketching and observation, videotaping proved to be a better technique to record and analyze the sequence of movements and interactivity. If facilities were available, an ideal way to record interactivity would be through 3D simulation of real images captured and transmitted from a video camera.

The intervention protocol easily could be applied in the fields of art, architecture, and even in ethnography, to name a few. In art, there are indications that some artists used quasi-ethnographic methods to document their artworks (e.g., Lozano-Hemmer, 2006; Nauman, Tate Online, n.d.-b). However, it is not clear to what extent this has informed their practices. Ethnographic mapping may offer new directions in the use of ethnography in this respect. It could allow for more effective organization of data and would facilitate the assessment and improvement of the artwork. In interactive art, this strategy may be used to examine the users' behavior or interactivity in response to the artwork. In ethnography, on the other hand, the bricolage process, which forms an important aspect of this strategy, may offer a deeper insight than observation alone. It might provide a creative and flexible process for the researcher.

In architecture, the strategy also promises to be appropriately applicable. At the beginning of this article, we referred to Lynch (1960) and Lusk (2002 as cited in Groat & Wang, 2002) as examples adopting mapping techniques in architectural research. In addition, the Space Syntax (n. d.) practice has recently grown to become a well-known tool to help architects simulate the likely social effects of their designs. Ethnographic mapping may also be developed to be used in architectural studies. In the case studies presented in this article, the intervention protocol was applied in various architectural spaces (entrance area, portico, public space). It would be interesting to apply these methods to environments of different scales, contexts, or functions; for example, a transportation system, an interactive space (smart room, interactive surfaces, etc.), or an educational space. Our understanding of the strategy would also be enriched if comparative studies were applied to a greater range of environments than the three installations studied here. Furthermore, this paper particularly focused on mapping sociospatial practices. Future studies may investigate mapping memory, sociological mapping, or mapping interactivity.

———————

ENDNOTES

1. The first case study is based on an installation called *Sited Moss: Invading or Fading Architecture.* It was exhibited in 17.09.2004 as a result of a collaborative project between Rosalie Kim (University College London) and Nadia Mounajjed (University of Sheffield). The second intervention *Under Scan* was a video interactive intervention by Mexican-Canadian artist Rafael Lozano Hemmer; exhibited between November 2005 and March 2006 in different public spaces in the UK. The third case study *Threshold* was an interactive intervention in 2006 by Nadia Mounajjed, Chengzhi Peng and Stephen Walker (University of Sheffield) in collaboration with Nick Bryan-Kinns (Queen Mary University of London) and Jennifer G. Sheridan (InfoLab21, Lancaster University).

2. For more information and images from the video footage of Bruce Nauman's (2002) *Mapping the Studio I (Fat Chance John Cage)*, see http://www.diacenter.org/exhibs/nauman/mapping/ Also, for information on the *Studio Notebook (Book 1)* (Nauman, 2001) see the Guggenheim Collection Web site, http://www.tate.org.uk/collection/ (The notebook was lent by the American Fund to the Tate Gallery in 2004).

3. For more information on the *[Dis]locating Specificity* conference, see
http://www.bartlett.ucl.ac.uk/architecture/events/conferences/dislocating.htm

4. For more information on Rafael Lozano-Hemmer, see http://www.lozano-hemmer.com/eprlh.html

5. In the filming of the characters to be projected in the space, the 'actors' were free to express themselves in the video portraits in whatever way they desired (R. Lozano-Hemmer, personal communication, January 13, 2006). As a result, a wide range of behaviors, emotions and attitudes were recorded and projected.

6. *Threshold* is a collaboration project funded by EPSRC Leonardo-Net network. It involves the following people: Nadia Mounajjed, Chengzhi Peng, Stephen Walker, Nick Bryan-Kinns, and Jennifer Sheridan. The piece was exhibited twice. In June 2006, it was first installed for the PSI # 12: Performing Rights Conference at the Queen Mary, University of London. It was re-exhibited at the same location for the First International Symposium on *Culture, Creativity and Interaction Design* (CCID 2006) on Tuesday the 12th of September, 2006. For more information on the project, see http://www.leonardonet.org

7. Dr. Jennifer Sheridan is the Director of BigDog Interactive Ltd. For more information see http://www.jennifersheridan.com.

REFERENCES

Besant, W. (1882). *All sorts and conditions of men: An impossible story*. London: Chatto & Windus.

Bishop, C. (2002). *The subject of installation art: A typology*. Unpublished doctoral dissertation, University of Essex.

Cuff, D. (1991). *Architecture: The story of practice*. Cambridge, MA, USA: MIT Press.

Denzin, N. K. (1997). *Interpretive ethnography: Ethnographic practices for the 21st century.* London: SAGE Publications.

Dia Center for the Arts. (2001). *Mapping the Studio 1 (Fat Chance John Cage): A new large-scale video installation by Bruce Nauman, opens January 10, 2002*, news release, December 14, 2001. Retrieved April 26, 2006, from http://www.diacenter.org/dia/press/nauman.html

Dion, M. (2000). *Archaeology*. London: Black Dog Publishing.

Foster, H. (1996). *The return of the real: Critical models in art and theory since 1960*. Cambridge, MA, USA: MIT Press.

Greverus, I.-M., Macdonald, S., Römhild, R., Welz, G. & Wulff, H. (Vol. Eds.). (2003). *Anthropological Journal on European Cultures: Vol. 11. Shifting grounds: Experiments in doing ethnography*. Hamburg, Germany: Lit Verlag Munster.

Groat, L., & Wang, D. (2002). *Architectural Research Methods*. New York: Wiley.

Haque Design + Research. (2006). Retrieved July 29, 2006, from http://www.haque.co.uk

Heath, C., & Hindmarsh, J. (2002). Analyzing interaction: Video, ethnography and situated conduct. In T. May (Ed.), *Qualitative Research in Action* (pp. 99–121). Thousand Oaks, CA, USA: Sage Publications.

Jensen, J. F. (1998). "Interactivity": Tracking a new concept in media and communication studies. *Nordicom Review*, *19*(1) 185–204. Retrieved May 6, 2006, from http://www.nordicom.gu.se/common/publ_pdf/38_jensen.pdf

Kaye, N. (2000). *Site-specific art: Performance, place and documentation*. London: Routledge.

Kim, R. & Mounajjed, N. (n. d.). *Sited moss: Invading or Fading Architecture*. Retrieved January 4, 2007, from http://www.bartlett.ucl.ac.uk/architecture/events/conferences/sited.htm

Kwon, M. (2004). *One place after another: Site-specific art and locational identity*. Cambridge, MA, USA: MIT Press.

Lynch, K. (1960). *The image of the city,* Cambridge, MA, USA: MIT Press.

Manchester, E. (2005). *Mapping the Studio Notebook (Book 1) 2001*. TATE Collection, Retrieved April 15, 2006, from http://www.tate.org.uk/servlet/ViewWork?cgroupid=999999875&workid=80865&searchid=10986&tabview=text

Marcus, G. E. (2003). On the problematic contemporary reception of ethnography as the stimulus for innovations in its forms and norms in teaching and research. In I. M. Greverus, S. Macdonald, R. Römhild, G. Welz, & H. Wulff (Vol. Eds.), *Anthropological Journal on European Cultures: Vol. 11. Shifting grounds: Experiments in doing ethnography* (pp. 191–206). Hamburg, Germany: Lit Verlag Munster.

McCarthy, J., & Wright, P. (2004). *Technology as experience*. Cambridge, MA, USA: MIT Press.

McTighe, M. E. (2005). *Epic forgetting: Mapping memory practices in installation art of the 1980s and 1990s*. Unpublished doctoral dissertation, University of Virginia.

Meyer, J. (2006). *The Macabre Museum*. Retrieved August 11, 2006, from http://www.frieze.com/feature_single.asp?f=524

Mounajjed, N. (in press-a). Interview with Rafael Lozano-Hemmer. In R. Lozano-Hemmer (Ed.) *Under Scan*. Italy: Emda and Antimodula

Mounajjed, N. (in press-b). Under Scan: Interviews with the Public. In R. Lozano-Hemmer (Ed.) *Under Scan*. Italy: Emda and Antimodula

Mounajjed, N., Peng, C., Walker, S., Bryan-Kinns, N. & Sheridan, J. (2007). Threshold (2006). In P. Wright & R. Dare (Eds.), *Post-proceedings of the first international symposium on culture, creativity and interaction design* (pp. 57–61). York, UK: University of York.

Reiss, J. H. (1999). *From margin to center: The spaces of installation art*. Cambridge, MA, USA: MIT Press.

Space Syntax. (n.d.). Retrieved August 30, 2006, from http://www.spacesyntax.com/

Susi, F. D. (1985). Spatial mapping as a method for observing classroom art instruction. *Studies in Art Education*, *26*(3), 163–168.

Tate Online (n.d.-a). Retrieved November 30, 2006, from http://www.tate.org.uk/learning/thamesdig/flash.htm

Tate Online (n.d.-b) Inside Installations: Mapping the Studio II. Retrieved January 22, 2007 from http://www.tate.org.uk/research/tateresearch/majorprojects/nauman/home_1.htm

Thompson, N., Sholette, G., Thompson, J., Mirzoeff, N., & Chavoya, O. C. (Eds.). (2004). *The interventionists: Users' manual for the creative disruption of everyday life*, North Adams, MA, USA: MASS MoCA Publications/MIT Press.

Virilio, P. (1994). *Gravitational space*. In L. Loupp. (Ed.), *Trace of dance: Drawings and notations of choreographers* (B. Holmes & P. Carrier, Trans.; pp. 35–59). Paris: Editions Dis Voir.

Wall, H. M., Karl K., & Smigiel, J. (1986). Use of contextual information in the formation of cognitive maps. *American Journal of Psychology*, *99*, 547–558.

Wallis, B. (1997). *Excavating the 1970s: Installation art, Renee Green, traveling exhibition*. Retrieved March 7, 2006, from http://www.findarticles.com/p/articles/mi_m1248/is_n9_v85/ai_19785379

Willats, S. (1976). *Art and social function: Three projects.* London: Latimer New Dimension.

Yin, R. K. (1994). *Case study research: Design and methods*. Thousand Oaks, CA, USA: SAGE Publications.

Authors' Note

All correspondence should be addressed to:
Nadia Mounajjed, Chengzhi Peng and Stephen Walker
School of Architecture, Arts Tower
University of Sheffield, Western Bank
Sheffield S10 2TN, UK
Emails: Nadia.mounajjed@gmail.com
         C.peng@sheffield.ac.uk
         S.j.walker@sheffield.ac.uk
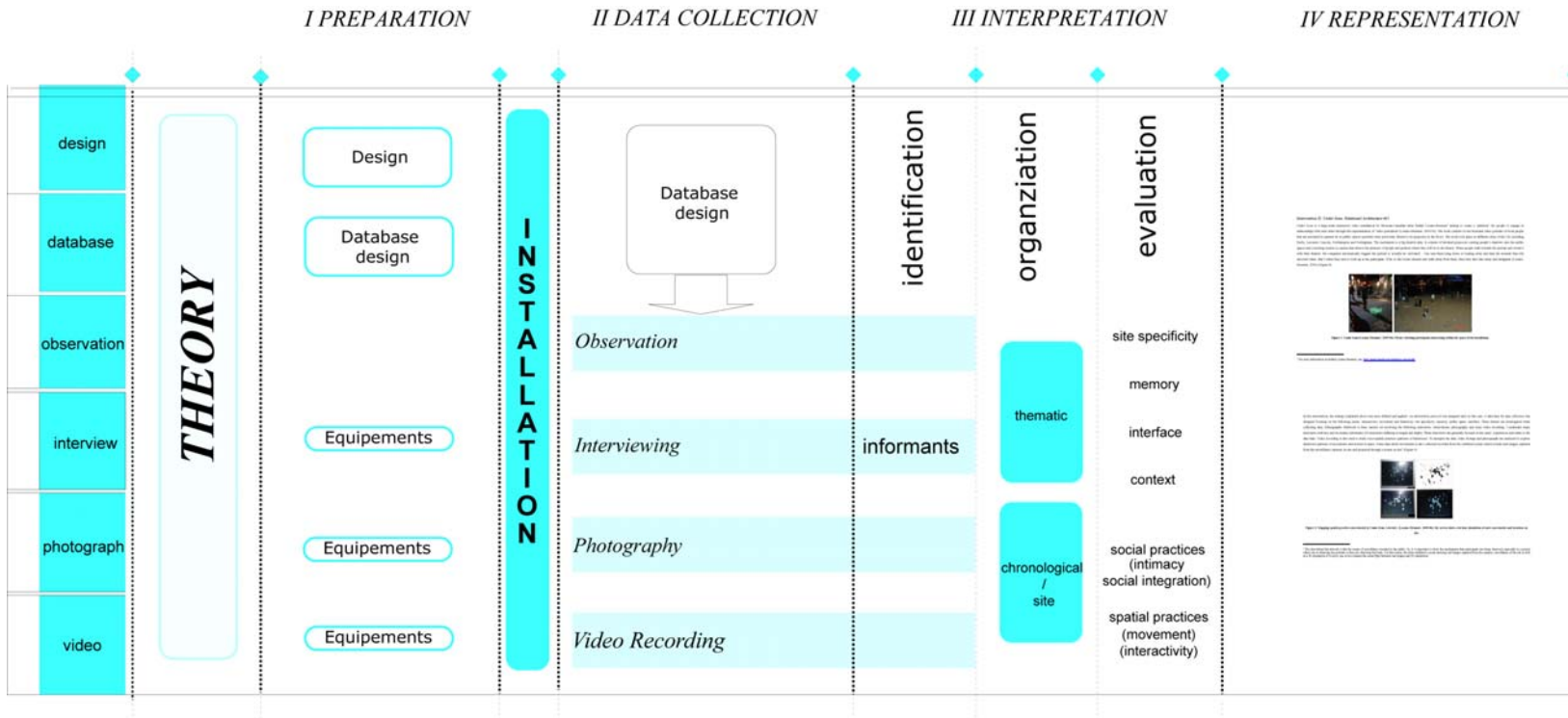
APPENDIX A

Appendix A. The Under Scan Intervention Protocol, illustrating the different phases of an ethnographic intervention. The table illustrates the different stages in the Under Scan intervention protocol. The protocol involves four phases outlined horizontally at the top. The areas in dark blue reflect the different methods used in this strategy.

APPENDIX B
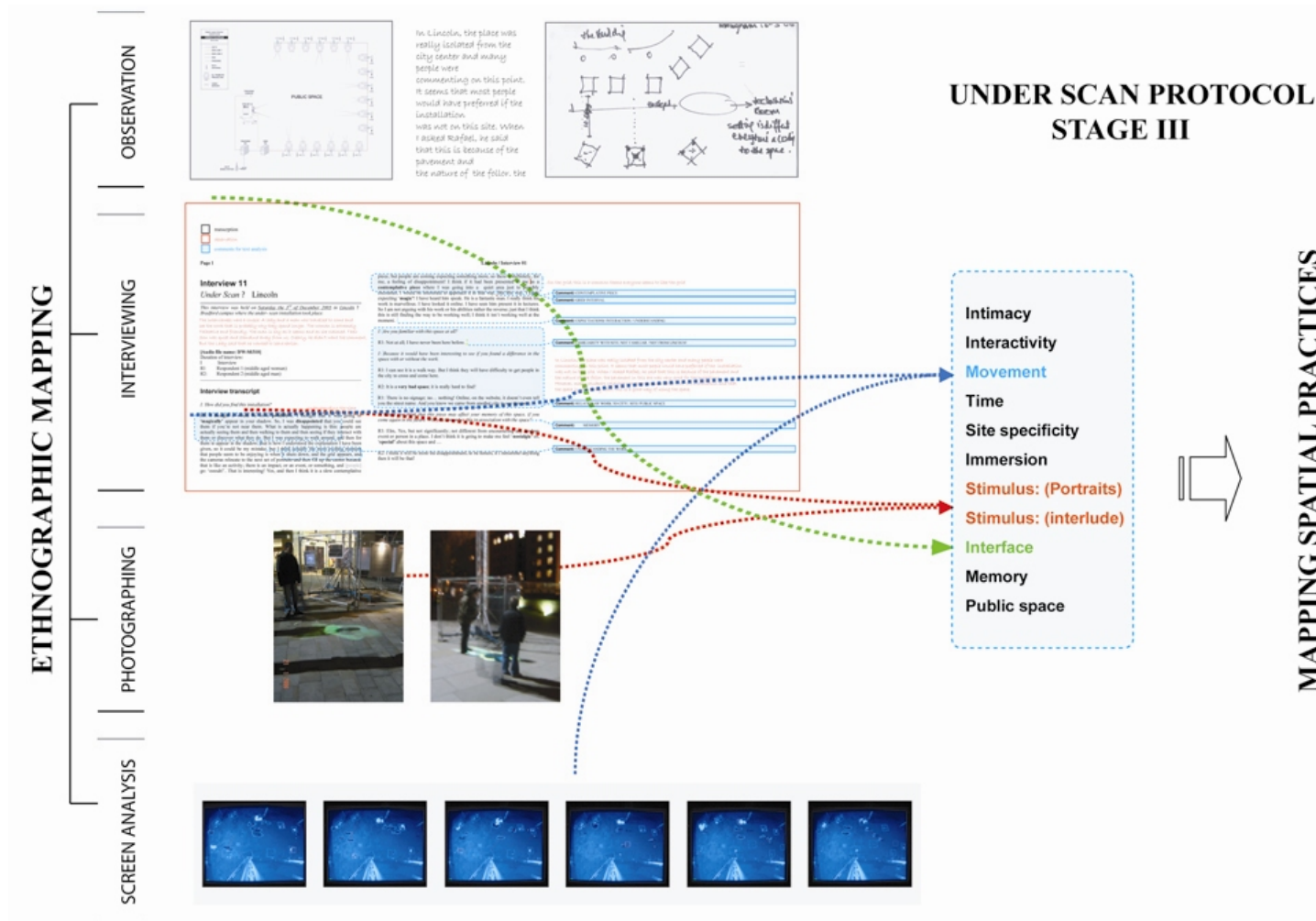
Appendix B. Under Scan Protocol: Images show a general overview of the ethnographic mapping process in *Under Scan* leading to analysis. It illustrates the different ethnographic methods of observation, interviewing, and interpretation. The following appendices will demonstrate more details on these methods.

APPENDIX C

On site observation

Interviewing

Screen

Photography / video (visual Ethnography)

Appendix C. Under Scan Protocol: Images illustrate the different ethnographic methods used in data collection. This involves (1) an on-site observation of the piece, with sketches and notes. (2) Interviews with users, technicians and artist, (3) screen analysis to gather information of people's movements and behavior, and (4) photographing and video footage to provide an accurate source of information for later analysis.

APPENDIX D

☐ transcription
☐ observation
☐ comments for text analysis

Interview 11

Under Scan ? Lincoln

This interview was held on Saturday the 3rd of December 2005 in Lincoln ? Bradford campus where the under- scan installation took place.

The interviewees were a couple: A lady and a man who travelled to come and see the work that is probably why they spend longer. The woman is extremely Talkative and friendly. The man is shy as it seems and as she claimed. Their Son was quiet and standing away from us. Clearly, he didn't want the comment. But the Lady said that he wanted to leave earlier.

[Audio file name: DW-S0310]
Duration of interview:
I   Interview
R1   Respondent 1 (middle aged woman)
R2   Respondent 2 (middle aged man)

Interview transcript

I: How did you find this installation?

understanding the piece

R1: I thought it would be more **predictive**. I thought that it was going to 'magically' appear in your shadow. So, I was **disappointed** that you could see them if you're not near them. What is actually happening is this: people are actually seeing them and then walking to them and then seeing if they interact with them or discover what they do. But I was expecting to walk around, and then for them to appear in the shadow; that is how I understood the explanation I have been given, so it could be my mistake, but I think actually the most exciting moment that people seem to be enjoying is when it shuts down, and the grid appears, and the cameras relocate to the next set of portraits and then fill up the centre because that is like an activity; there is an impact, or an event, or something, and [people] go: 'ooouh!'. That is interesting! Yes, and then I think it is a slow contemplative

piece, but people are coming expecting something more, so there is definitely, for me, a feeling of disappointment! I think if it had been presented to me as a **contemplative piece** where I was going into a quiet area just to possibly encounter, I would be interested to approach it in that way. But this way, I came expecting '**magic**'! I have heard him speak. He is a fantastic man. I really think his work is marvellous. I have looked it online. I have seen him present it in lectures. So I am not arguing with his work or his abilities rather the reverse; just that I think this is still finding the way to be working well; I think it isn't working well at the moment.

On the grid, this is a common theme everyone seems to like the grid

Comment: CONTEMPLATIVE PIECE
Comment: GRID INTERVAL

Comment: EXPECTATIONS/ INTERACTION / UNDERSTANDING

I: Are you familiar with this space at all?

R1: Not at all; I have never been here before.

Comment: FAMILIARITY WITH SITE: NOT FAMILIAR / NOT FROM LINCOLN!

I: Because it would have been interesting to see if you found a difference in the space with or without the work.

R1: I can see it is a walk way. But I think they will have difficulty to get people in the city to cross and come here.

R2: It is a **very bad space**; it is really hard to find!

R1: There is no signage; no... nothing! Online, on the website, it doesn't even tell you the street name. And you know we came from another city to see this, so ...

In Lincoln, the place was really isolated from the city center and many people were commenting on this point. It seems that most people would have preferred if the installation was not on this site. When I asked Rafael, he said that this is because of the pavement and the nature of the floor, the pavement in this are was very good for the projections. However, many students said that the space is much better with the installation and that the space is not usually used, this is a good way of using the space.

Comment: RELATION OF WORK TO CITY/. SITE/ PUBLIC SPACE

I: Would you think that this piece may affect your memory of this space, if you come again in the future. Will you remember this in association with the space?

R1: Elm, Yes, but not significantly; not different from encountering any random event or person in a place. I don't think it is going to make me feel 'nostalgic' or, '**special**' about this space and ...

Comment: MEMORY

R2: I think it will be more the disappointment, to be honest, if I remember anything then it will be that!

Comment: UNDERSTANDING THE WORK

Appendix D. Under Scan Protocol. The image demonstrates the process of transcribing the interview, then analyzing the text to relate it to the main themes of the research. It also demonstrates some red notes recorded by the interviewer during the interview. With the most important ideas selected and highlighted in light blue.

OPEN SOURCE AND NEW MEDIA ARTISTS

Katri Halonen
Faculty of Culture
Helsinki Polytechnic, Finland

Abstract: *This paper deals with the open source method practiced within the new media art context. I present a case study on an international festival, PixelACHE 2005, which was organized by and for new media artists and served as a platform for demonstrations of new media projects and as a meeting place for experimental new media artists. In this article I discuss how new media artists adapted the open source ideology. Open source is seen both as a more liberal method of distribution and as an open joint creative process. I was particularly interested in what kind of motives the new media artists had for taking part in the PixelACHE festival and the joint artistic creative process. In my analysis, I found four different groups that have diverse motives for participating in open source art projects. One group contains the key persons who use the open source network as an important reference in their professional image. Members of the second and third group are new media artists who earn their main income in either the public or corporate sector and use open source projects as a learning platform. The fourth group comprises young enthusiasts who are seeking jobs and professional networking opportunities in the open source network.*

Keywords: *experimental new media art, open source art, Creative Commons licensing*.

INTRODUCTION

New media is an artistic field that has developed around cultural development projects, with the computer playing a central role as the medium for production, storage, and distribution. It has also influenced a number of new models of authorship, which all involve different forms of collaboration. This challenges the romantic notion of a solitary author of an artistic artifact (see Manovich, 2001a, p. 125), though Lev Manovich (2001b, p. 1) states that solitary authorship actually occupies a very small place in the history of human culture while collaborative authorship represents a norm rather than an exception.

The Open Source Ideology

The open source ideology has emerged within the software development arena. Its fundamental idea lies in openly-distributed source code and voluntary-based, joint development of software. When software programmers are able to read, redistribute, and modify the source code of a piece of software, the software evolves. This happens in a process where software developers improve the software, fix defects, and adapt it for their own purposes. The open source movement has been researched from the technical software development (e.g., DiBona, Ockman, & Stone, 1999; Feller & Fizgerald, 2005), business (e.g., Fink, 2003; Raymond, 2001), and legal (e.g., Lessig, 2004; Rosen, 2004) perspectives.

Open source can also be viewed as an approach to organizing collaboration over the Internet. The collaboration can lead to all sorts of content, not just software development. In this article I am interested in the cultural change that the open source method is bringing to the field of new media art. Manuel Castells, in his *The Information Age* trilogy, has written about the economic, social, personal, and cultural changes that are occurring in the age of computerization. He includes the open source movement in his analysis. In his book *The Internet Galaxy* (2001, pp. 101, 199), Castells states that the open source logic of cooperation is not limited to software, but could be applied, for example, to artistic creation. As Castells (2005, pp. 1, 9-10) has recently pointed out, open source refers to a "form of social organization of production" that "works as an open network of voluntary cooperation." He points out four challenges in the open source concept: (a) the motivation of the volunteers taking part in the process, (b) the economic logic that departs from conventional market logic, (c) the coordination of hundreds of volunteers without a hierarchical organization, and (d) the management of the complexity.

Steven Weber (2004) has researched the social perspectives of the open source movement by analyzing the software development process. He is especially interested in the concept of ownership within the open source context. A similar new concept has also been introduced by Castells (2005, p. 1). Both of these authors see that while a capitalist economy is based on the right to exclude others from the use of goods or services, the open source property thinking is built around the right to distribute, rather than to exclude.

New media theorist Lev Manovich (2001b, p. 6) points out two aspects of the open source movement that are interesting when applied to a cultural sphere. First, new licensing schemes have been developed alongside open source development. The licenses specify the rights and also the responsibilities of a person modifying the code. The second aspect is the idea of the kernel. In a software environment, the *kernel* is the very core of the code that all developers are careful not to change in any fundamental way. Manovich assumes that there could be many collaboratives and individual works in the arts world that already employ the ideas of these licenses and the kernel, even if under different terminology.

Open Source Distribution and Process

In the software business, the control of the source code is the foundation of the business model. Similarly in the art world, authorship-based copyright is the foundation of business. Traditionally in the Western world, the copyright system has aimed to guarantee artists a fair compensation for their work (Bettig 1996; Bollier, 2003, p. 119-134; Frith & Lee, 2004;

Lessig, 2004). In the Nordic countries, copyright is based on contract licensing. The law in each of the Nordic countries is identical in all important aspects and is often described as Nordic legal unity (Duelund, 2003, p. 503). In the Nordic countries, copyright is an exclusive right that is authorized under Section Two of the law on copyright. The starting point of the law is that an author has exclusive rights to decide on usage and distribution of his/her works. Copyright is seen as the basis of the income within the creative industries, of which media art is one. In reality, the union-based copyright system greatly benefits a few famous artists and a few major enterprises, but it has little to offer to most creators (Betting, 1996, p. 34-42; Litman, 2001, p. 14).

Weber (2004, p. 1) argues that "the conventional notion of property is the right to exclude you from using something that belongs to me." In other words, the core of a property right can be seen as the exclusive right to choose whether, and on what terms, the property is made available to others. In the open source environment, property is configured fundamentally around the right to distribute, not the right to exclude (Weber, 2004, p. 228). There are numerous types of licenses in the open source movement that have been developed, as well as free operating systems (such as GNU/Linux) and software that follow the General Public License (GPL). In the GPL, the term *copyright* is replaced with the "copyleft" idea[1]. Copyleft licensing gives all recipients of a program the right to run, copy, modify, and distribute the program, while forbidding them from imposing further restrictions on any copies they distribute. From this copyleft approach, licenses for content creators also have been developed. One set of licenses used by artists are the Creative Commons licenses (Creative Commons UK, 2005), a range of copyright licenses that are freely available for public use and allow the creator or creators to fine-tune control over their work in order to enable as wide a distribution as possible.

In Himanen's (2001, p. 32-47) opinion, open source developers, whom he calls *hackers* are pro-individual and anti-authoritarian. A similar definition is given by Castells (2001, p. 52), though he adds that hackers are working for the common good—at least for the community of hackers. Castells (2005, p. 2) clarifies four years later that the open source is anti-capitalist in the sense that it is "compatible with different social logics and values." According to Tarkka (2002, p. 93), open source development is becoming a more typical way of functioning within Finnish universities, where new tools are developed and given for use in public and private sectors. The inner joy of creation has often been identified as an attribute of the open source software developer culture, bringing it, according to Castells (2001, p. 47), close to the world of art. Weber (2004, p. 73), in discussing the motives of open source developers for participating in open source projects, states that these developers look for cool opportunities to create new and exciting functions.

Internet-based distribution is already in use in the field of arts, where Creative Commons licenses are increasingly being used. With a Creative Commons license, others can usually freely cite artistic content as long as the artist is always mentioned. But all commercial use is limited and copyright for commercial use remains with the person or team that has created the content. For example, musicians such as the Beastie Boys and David Byrne have released records under the Creative Commons license; horror genre author, Stephen King, published in 2000 his book *Riding the Bullet* exclusively as an electronic book available free of charge for download during the first days after the publication; and Project Gutenberg[2] has made available more than 16,000 e-books for free, including many classics of world literature.

Project Gutenberg aims to publish one million free e-books by the year 2015. These are only a few examples of creative content available via the Internet for others to use under Creative Commons licenses.

Castells (2001, p. 47) and Weber (2004, pp. 149-150) have introduced the idea of a "gift culture" or "gift economy," respectively, into the narrative of open source, stating that it is a dominating working mechanism among open source-based developers. Raymond (2000) states that status, power, and wealth are a function of what you give away instead of what you control. Gifts bind people together because they create an obligation to give back. Weber (2004, p. 150) argues that the gift culture logic works particularly well in software because the value of the work is hard to measure in concrete replicable terms. This reasoning might also fit well in the field of arts, where measuring the value of each artifact is difficult. An artistic artifact released under a Creative Commons license could also be seen as a gift.

The open source movement is not only about a more liberal distribution system. Open source can be seen also as a process of joint creation. In the seventh chapter of his book, *The Internet Galaxy,* Manuel Castells (2001, p. 199) anticipates art as a growing area of the Internet, stating that "open source art is the new frontier of artistic creation." He also presents the idea of open source art where *art* refers to computerized graphic design. Castells feels that open source art could result from a collective, interactive, joint process when the art is produced in interaction through groupware practices. For Castells, the Internet not only serves as a means for distribution of artifacts, but also serves as a platform for a process that aims to create new artistic artifacts. Ingo (2005, p. 183) also underscores that the strength of the open source ideology does not lie on the free use of the artifact but on the different creative process.

There are many examples of jointly-created, Internet-based, open source artifacts, such as the numerous updated manuals for using the Linux operating system. Joint creative content that is open for Internet users can be also found, for example, in fan fiction stories[3] or Wikipedia[4], an open source encyclopedia. The joint creation process of the artifact blurs the traditional concept of the author as a solo artist or a group of artists each holding the copyright of their own impact on the artifact.

Media art is based on cooperation to a greater degree than are many art forms that can be created alone. The bases for creativity and innovation are the media laboratories, networks, and production teams (Tarkka, 2002, p. 39), and this collaboration creates difficulties when determining who the author is. For open source artists, the concept of authorship differs from the traditional copyright ideology. So when copyright is no longer the main means to compensate creative work, there is a need to find new means to compensate for artifacts.

The open source process is largely built around a key person. Weber (2004, pp. 73-74) argues that the project leader often has to place extra emphasis on how cool or valuable as a learning experience a project is. Since the project is built on a large base of volunteers with diverse interests and expertise, the task can be difficult. The leader needs to find a balance between exciting challenges and a credible assurance that the challenges will be met. Castells (1996, p. 415) states that the key persons in the networks can be called "dominant managerial elites" who play essential roles within the networks, describing them as cosmopolitans who must retain local contacts to ensure the coherence of their group. Himanen (2001, p. 73) adds that, in principle, anyone can gain authority in the open network, based on his or her merit.

Merchandising open source work is problematic, however. In the open source software business, the logic has shifted from right-to-use licenses to selling services and support merchandise. Weber (2004, pp. 195-197) names several alternative ways to generate income in an open source software business: selling support packages and customizing services to users; linking free software to demand, and the seeding of a larger market for a commercial product, by accessorizing, for example, manuals; and the branding of the product though the source code of the open software itself is not owned by the company.

The open source ideology, hacker logics and values, and Internet-based distribution have also landed in the field of new media art events. These networking and demonstration gatherings are also often built around a key person or persons, and allow for joint creation and new interpretations of authorship that arise from these open source-related new media events.

There are a great number of different open source-related art and cultural events. In Europe, for example, there are the software art festivals PixelACHE in Finland, READ_ME in France[5], Pikse1[6] in Norway, and MAKE ART[7], which changes its location annually. The festivals serve as a demonstration platform for open source and experimental new media art projects while a great deal of the joint work is presented and developed in media laboratories, hack meetings, and hacklabs and at other meetings such as Dorkbot[8] meetings organized locally around the world, and OpenLabs[9] in London. There are also several open source art software development projects that have collected a great number of artists around them, such as live CD software for multimedia production called dyne:bolic[10] and Kingdom of Piracy[11], which serves as a open workspace for open source software and art projects.

This article presents data from empirical research of a new media art festival, PixelACHE 2005. I will discuss how the open source ideology is used by the new media artists who present their work during the festival.

THE CASE: PixelACHE FESTIVAL

PixelACHE is a festival on electronic art and its subcultures, such as video jockeys (VJ), live performers who mix visuals in much the same way the DJ mixes music. The festival program consists of concerts, clubs, project showcases, workshops, and panel discussions from a broad range of disciplines: artists, engineers, designers, researchers, and architects. PixelACHE focuses especially on presenting activities of various international grass root networks and communities, such as the VJ community, media activists, and the open source community. It also serves as a demonstration platform for new media projects. The goal of the PixelACHE festival is to act as a bridge between the traditional creative disciplines and the rapidly developing electronic subcultures. According to the event's Web site (PixelACHE, n.d., ¶3), the name PixelACHE describes "the feeling that results from an overdose of digital media content. This overdose can happen easily if the content is too monotonic—which is the case if standards, formats, tools and design principles converge to a very limited set of options." The festival aims to bring together technology and art experts interested in experimental new media artwork.

The first festival took place in Helsinki in 2002 and presented about 15 local new media artists or artist groups and a guest media artist from New York. From this point forward, the vision for the festival became more international. The second PixelACHE festival took place

a year later in Helsinki with more than 100 artists taking part, of whom 24 were international guest artists. The festival continued on tour in June 2003 that took the artists first to New York and, immediately following, to Montreal. In 2004, PixelACHE started in Stockholm and continued in Helsinki, and was partly funded by the European Union Culture 2000 funding scheme. More than 100 artists took part in the festival, along with an audience consisting of about 6,000 people. The main information channel of the festival is its Web site and mailing lists that are free for anyone to join.

This case study is based on material collected on the PixelACHE2005 festival that was held 14-17 April. In 2005, the festival program presented a very diverse group of artists, engineers, activists, architects, and designers who share the open source and non-profit ideology. There were again more than 100 artists and an audience of about 6,000 people. The theme of the PixelACHE 2005 festival was Dot Org Boom, and it concentrated on open source communities, open content initiatives, media activist networks, and the myriad non-governmental organizations (NGOs) around the world. The festival had three sub-themes: the VJ culture, experimental interaction and electronics, and interactive and participatory cinema. The presented projects were mainly prototypes that were introduced to a larger audience for the first time. At the core of the festival were the presentations and workshops where the audience got to know the both the projects and the artists. The 2005 festival presented 17 VJ culture and audiovisual performances, nine projects concentrated on experimental interaction, and three projects were about participatory cinema.

The festival was organized by the Piknik Frequency association and the Kiasma Museum of Contemporary Art. Two individuals have held key roles in organizing every PixelACHE event, although the people responsible for managing specific events changes. The Piknik Frequency, a registered association, carries the main responsibility of organizing the PixelACHE festival, but in reality the festival is organized by a cluster of different networks, namely the Amfibio collective, Olento Ltd., and the Katastro.fi registered association. Each network has its own specific aim. Amfibio is a Helsinki-based collective that focuses on developing the VJ culture. There are about 15 active members, mainly students at various universities in Helsinki. Olento Ltd. is a production company providing mainly educational and consultancy services. It shares office space and often collaborates with Katastro.fi and Piknik Frequency. Katastro.fi is a non-profit association whose registered members are designers, programmers, scriptwriters, and producers working in Finnish new media companies and research units interested in the experimental new media art field.

RESEARCH METHODS AND DATA

This case study is based on three interviews, the project archive of the PixelACHE 2005 festival, and my own observations of festival activity. I will now describe the data gathered and my methods.

Interviews

In the two months following the April 2005 event, I interviewed three people involved with the festival. Each semi-structured interview lasted between 90 minutes and 2 hours. One

interviewee is the artistic director who has created the whole festival from the beginning to what it is nowadays. The artistic director is a media artist, software designer, and curator who has devoted most of his time and energy to developing cultural organizations and events. During his interview, I focused on how he sees his role in the festival and networks around the festival, and how he describes the artist network and the members of the networks. I also wanted his opinion on how new media artists perceive open source ideology.

The other two informants are artists who presented their work at the festival. Their artistic work is based on collaboration with mainly Finnish new media enthusiasts. One of the artists has more than 15 years working experience in the field; she has also worked internationally and collaborated with foreign artists during the creative process of several new media experiments. The other artist has 4 years experience in the new media field. He works part time, and occasionally full time, on short open source art projects, but his main income is generated mainly outside the new media art field. He has volunteered in several successful new media projects, but has not received any financial income from his work, or at least not directly. During the interviews with the artists, I focused on how the open source ideology and co-creation affect their creative process, and their opinions regarding what motivates artists to take part in joint creation.

I audiotaped the interviews and transcribed them to create a written text. The interviews were conducted in Finnish with native-speaking Finns, and I have translated the comments into English. In my analysis, I focused on the kind of groups the informants named among the PixelACHE network, how they described the groups, what motivates them to take part in open source art projects, and how they identified themselves with the groups.

Secondary Data

The Web site of the PixelACHE 2005 festival has a large archive[12] where the presentation of projects (a total of 46), artists, exhibitions, press releases, and recordings of live events of each festival can be seen and downloaded. The core materials used in this study are the presentations of each artist, group of artists, and networks that presented their artistic projects or installations during the festival. I have used the archive to gain an overall picture of the number and roles of artists taking part in each project, finding out the background organization of each artist, and the licensing scheme used by each project. The scopes of the artist biographical data vary considerably, from three lines to extensive explanations of the artist and his/her previous projects. In addition, almost all of the artists have comprehensive personal Web sites, from which I found additional information about the artists' background institutions and other activities in the new media field.

In the history of the festival, there have been two event managers. Under my supervision, these event managers wrote their final polytechnic theses about the processes of developing and managing the festival. One individual wrote in 2003, the other in 2005. The first thesis I steered was written by the manager of PixelACHE 2002 and 2003 and centered on analyzing the organizational structure of the festival. The author of the second thesis was responsible for the PixelACHE 2004 and 2005 and wrote about the managerial problems that the festival had faced during the rapid growth that had taken place between 2002 and 2004. During the thesis supervision process, I met both festival managers over 10 times and read nine of their interview transcriptions as well as several versions of their theses. The supervision of their

work has given me an insight on the festival and the tensions within the network. This experience provided secondary data, presenting background on the festival and the networks behind it. It proved to be highly useful when I selected my interviewees and decided the themes of the interviews and formulated relevant questions. The research findings discussed next are based on the interviews.

RESEARCH FINDINGS: CHARACTERISTICS OF PixelACHE ARTISTS

As the PixelACHE network is built from very different types of artists, new media enthusiasts, and software developers, it is obvious that the motives to take part in the network also differ. The artist informants named four entities from the network with distinct motives and expectations of the network: key persons, public institution-based members, corporate members, and new enthusiasts. In this chapter I discuss the motives of each group for taking part in new media activism. Public institution-based members and corporate members are discussed as one group since they share the same basis of getting their income through employment in an organization.

Role of the Key Person

The networks surrounding the PixelACHE festival have not come about accidentally. Instead, they have grown up around a key person and remain active mainly through this person's initiatives. The artistic director is a founding member and also chairman of the Piknik Frequency registered association, Katastro.fi registered association, Amfibio collective, and Olento Ltd., networks, and thus the key player in all of these organizations. Olento Ltd. generates most of its income from organizing cultural and educational events but it gives most of its profit to the non-profit associations that organize the PixelACHE event and that have lower taxation rate. According to the art director informant, the image of a registered association is an important factor when applying for public and third sector funding, sponsorship, and event organization in Finland. The registered association status gives a more fiscally responsible, trustworthy, and professional identity for the events, as compared to having no official status or a corporate status.

Himanen (2001, p. 73) states that, in principle, anyone can gain authority in an open network, based on his/her merit. In PixelACHE's case, the festival's key person, the artistic director, is respected in the community because of his innovative festival programming and his own artwork that is known internationally in the new media sector. His artistic work and international recognition has been demonstrated in jury assignments, awards, and in roles as a lecturer and workshop leader. He also has been a guest speaker in several respected new media conferences and expert meetings around the world.

As the festival's key person, t he artistic director's international reputation gives credibility to the networks and, at the same time, the networks support his reputation as the key person. The reputation of the key person enhances the brand of the whole network. As the artistic director described, *"The main credibility is gained through traveling a lot in all kinds of happenings and, after all, people know who I am."*

Harris (2002, p. 68) argues that the brand of a network is often better known than the name of an individual actor. In this case, that comment was only partly true. The artistic director had an extensive artistic career beyond his involvement in the network and he was well known for it. For the PixelACHE festival, the credibility of the artistic director as the key person is important when working with other networks. This point was emphasized by the artistic director during his interview.

On the other hand, the members of the network are not part of the cluster only because of the reputation of the key person. The common interest for joining the network rises, in the opinion of the artistic director informant, from two main sources. First, the members of the network wanted to develop open source software to help create new media artifacts and find solutions to technical problems that artists find when putting together new experimental artwork. Second, the network serves as a platform for artists and other creative developers to present and test their artwork. The members of the network form a diverse group of enthusiasts willing to interactively test the experiments at different phases.

Still, the role of the key person in the life of the network cannot be underestimated. The artistic director informant himself questioned whether the network is even functional without the key person.

> *When I try to keep these organizations alive, we have an eternal problem. Since I am the person who has started these networks, the activity tends to fade away if I am not present all the time. This has happened in very many networks that I know: When the key persons leave, the whole community breaks up.* [Artistic director informant]

The PixelACHE networks are open, flexible, and project-oriented. This reflects Castell's (2000, p. 145) category of a social network where the operational unit is a project. Artistic projects are a central function of the PixelACHE networks. The key person has a central role in starting new projects. The artistic director informant describes the process as follows:

> *I go to the Net and say "Hey I've got this idea. I can develop it to this stage, please join me!" This is how the projects start. When the artists are selected, I use the criteria of finding new, exciting, and suitable projects to be presented during the festival.* [Artistic director informant]

In many cases, the artistic director informant was the initiator of a new project but he did not necessarily stay with the project until the end. In practice, most of the projects presented at the PixelACHE 2005 festival were based on the individual artists' own processes that were not jointly developed within the networks. According to the artistic director informant's experience, the joint development usually steps into the picture after the artists and other developers get to know each other personally during the festival. In this respect, the festival serves as an essential meeting place where connections are made and later possibly developed via the Internet towards joint creative artistic projects. This process is quite different, therefore, from the open source software development process. The artistic director informant stated that the personality of the coartist or codeveloper is highly important in the art scene, while in the open source software context, the usefulness and correctness of the code are most important.

The artistic director informant described himself as a person who directs the development process in the networks and supports others' creativity. He names the enthusiastic joy of creating new things with similar-minded people as his guiding motive. Trust also plays an important role in the community. His credibility as the key person gives a trustworthy label for the network, an important element when contacting other networks.

Institution-based Artists in an Anti-Institutional Environment

The majority of the PixelACHE artists are employed by a corporation, or by a public or third sector organization. All of these entities comprise the second and third groups in my analysis. In principle, the main income of the members of these groups is generated outside the open source art projects. When I followed the links of the artists presented in the project archive of PixelACHE 2005, I found several professional titles used outside the open source art field. The members of the networks around the PixelACHE festival often work with titles connected to new forms of interaction (e.g., concept designer, information architect, interface designer, interaction designer), production and management (e.g., audio designer, flash designer, rich media designer), digitalized PR work (e.g., art director, copy writer, visual/graphic designer), technical expertise (e.g., software designer, database programmer, site builder), creative management (design manager, creative director, project manager), or in various roles in the educational and consultancy sectors. Artists, especially, often were currently affiliated with a university, college, or polytechnic, or they lived on art grants.

In the program catalogue of the festival the institution-based artists did not identify themselves through their background organizations but as sole actors. Individualism was stressed in the open source art community, just as in the open source software development communities. However, when presenting jointly developed artwork, the collectiveness was stressed in the presentation of a joint project.

> *The authorship thinking is manifested during the performances of the festival. When the creative process is done jointly, often the performing of the work is done so too. The performer is not a "big star" taking over the stage. The performer is just one person on the stage with all the other authors. So, in the performing practices, we also question authorship.* [Artist informant, female]

Some of the artists used an artistic nickname. Both interviewed artists proposed that this is done by artists in order to separate their identity in the volunteer-based experimental playground from their day job identity built around their own name.

The artist informants used the term *hacker* in describing themselves. The interviewed younger new media artist defined the term *hacker* in a positive way:

> *It [hacking] is a way to function and collaborate in order to test and create new interesting things. Hackers are smart enough to see how much more power there is when a large network combines its labor and thinking. I think that a hacker feels pride about being a hacker.* [Artist informant, male]

This perspective falls well with Castells' (2001) and Himanen's (2001) positive definition of hackerism as an ideology where new solutions are published and openly available to benefit the whole community. This can be seen, for example, in the academic tradition, where openness and joint work towards development is based on the ethics of science, not the law (Castells, 2001, p. 40; Himanen, 2001, pp. 70-71; Tarkka, 2002, p. 93).

Open source artists seem to be, at least in the view of the artist informants, less anti-authority-oriented than the software developers discussed by Himanen (2001, pp. 32-47) and Castells (2001, pp. 49-51). The artist informants viewed authority as split between public/governmental institutions and corporations. The governments in the Nordic countries have played an important role as financiers of the art sector and are seen in a positive light by all of the interviewed informants. Actually, the role of the government or state institutions is important for the open source art hackers. In the case of PixelACHE, it has been important to find cooperation from public institutions in order to ensure facilities, finances, and status for the festival. An alliance with the Kiasma Museum of Contemporary Art, located in Helsinki, was realized in the second PixelACHE festival in 2003. Only a year later, the festival received financial aid from the European Union, which gave an even more institutionalized identity to the festival of 2005. Neither the artistic director informant nor the artist informants saw any image problem or threat in the more institutionalized status of the event.

Although the anti-governmental or anti-institutional aspect of the open source hacker culture is not deeply held within the PixelACHE open source artist network, anti-corporation perspectives are still deep seated. The corporation-based artists underscore this perspective by using Creative Commons licensing. The free use of content in non-commercial environments gives the artwork the possibility to touch a wide range of people and, through this process, the team behind the content gains popularity and possibly new, interesting projects based on the ideas and skills they have demonstrated.

The PixelACHE festival has a corporate global IT sector sponsor, even though the open source model was seen as a rival to corporate methods. As the artistic director informant stated, *"The open source model and corporate model are two camps that have been polar opposite. I think the gap between the two should be reduced, so that both sides would understand the other side a bit better."*

The motive for the corporate sponsor to take part in the festival was, according to the artistic director of the festival, a willingness to understand grassroot-level networks. The corporation representative aimed to find a good way to cooperate and was afraid of being neglected because he came from the corporate environment. When working with the sponsor, the festival director made special effort to see that the sponsor stayed at arm's length from artistic decisions. Yet, having a corporate sponsor for an open source art event has created tensions inside the community because of the influence that sponsor has to the image of the festival. The informants divided the corporate world into "good" and "bad" companies on the basis of the attitude that the corporation had towards the open source ideology. Bad companies were those that treated open source hackers as criminals. The good companies were those open to see what kind of networks there are and that something could be learned from them or even jointly created. In the long run, the good companies are expected to give something back in exchange for the creative content received by an open source artist. The final decision of including a corporate sponsor at the PixelACHE event was made by the

festival director and accepted by the community on the basis of the trust that the community holds for the director.

In new media art, artifacts are created within media laboratories, networks, and production teams, with the goal of constantly exploring, experimenting, and learning from the other members (Tarkka, 2002, p. 39). The creativity is born within individuals, but the artwork is created in teams. The software coders behind the PixelACHE network have put their efforts into creating new open source software that the artists have used creatively. There have been several software programs developed, presented, and tested by the members of the PixelACHE networks during and after the festivals. At the same time, the ideology has slowly expanded towards open content creation. Still, the copyright tradition seems to slow down the spreading of the ideology more widely into the arts field. The copyright problems are caused, according to my interviewees, because of a new interpretation of authorship. The new interpretation of authorship is raised from the new method of joint creative work that blurs the role of single author that forms the basis of copyright law, and because of the open distribution of artifacts.

The public institution-based members (mostly from universities and other educational institutions, research centers, or art organizations) seem to use PixelACHE to find new perspectives, to get in touch with the rapidly changing development of the new media sector, and to present their ideas in order to get feedback from the other members of the network.

> *The university is often isolated from the new media art field, so the meetings are an important way to find out what is going on in the real world. Last year my friend presented a sound demo at the festival and got more comprehensive feedback and ideas on how to develop the project than he would ever get from his colleagues at the university.* [Artist informant, male]

Because much of the work is funded by public institutions, the younger interviewed artist thought that a more liberal use of artifacts is reasonable. Nearly all of the work presented at the festival was done under Creative Commons licenses, so the author retains the possibility to exercise some form of control over his/her work, but at the same time makes it easier to use by those who want to borrow ideas and sample material. The network helped the artists to develop their projects in the daily work often supported by the public sector. When new innovations are born rapidly, it is hard to stay up-to-date. The open source community serves as a way to get information on the latest developments in the field of new media art.

Software development-oriented members of the network are looking for new challenges, ideas for the software they use, and also to place their own software to be tested by the artists.

> *Many of the members of our network live two lives. One is for the income and their projects are completed so that the outcomes are strictly copyrighted. Then the other life is around the new exciting projects that one just wants to be involved with.* [Artist informant, female]

The virtual networks are a platform for experiments and mutual learning that also help individuals to succeed in their work environments. Still, transferring open source products into business applications can be quite problematic. For example, in the case of Linus

Torvalds, an open source operating system developer, his income comes mainly from consultancy and not from an actual open source product such as the Linux operating system (Weber 2004, p. 194). Already by the mid-1990s, the open source ideology had expanded the IT sector. As a result, people often want help in installing and in using the open source software. For example, although Linux can freely be downloaded, people do buy it on CD because of the accompanying manual. Selling services also creates longer-lasting clients. But how does the "Give away software for free; sell services for a fee" ideology fit the open source art community? Exactly the same way: The key persons of the communities often live off of consulting services and by working as special experts in several projects. For them, the PixelACHE network was a test environment and an important reference.

> *It is quite problematic to earn income associated with the networks I run. There are so many people voluntarily working in the network that it is difficult for me to take income out of the work around the network. The other members would question the whole work. Still, I carry the main responsibility, give my name and identity to ensure the status of the network, and am responsible for the most initiatives.* [Artistic director informant]

Meanwhile, the corporate members of the PixelACHE community felt tension from their peer commercial media sector workers who are employed in the corporate world but not involved at all with the open source community. The reason for this tension was, in the artistic director informant's opinion, that the open source community has questioned the artistic process coming from a sole creator. When different types of experts join together in a creative process, the end result is often better, as compared to a sole artist who tries to be an expert in all aspects of new media art, such as sound, graphic design, and technical script writing.

The artists who hold a day job at a corporation seem to wear two hats. Their work in the day job is copyrighted while their volunteer-based development work is mostly released under Creative Commons licenses. However, the two worlds suit each other very well. The PixelACHE network serves as a playground for developing artistic ideas and having fun with them. At the same time, artists update their knowledge, gain important contacts, and stay in touch with developments that help them in their day jobs.

Young Enthusiasts

A fourth group of members in the PixelACHE network were the artists just entering the field without a secure position in the workforce. Only rarely would someone call himself or herself a "media artist." A more typical title was just artist or visual artist. Similar findings have been found on the basis of a large empirical study by Mäkelä and Tarkka (2002, p. 19), who argue that the authors in the new media field do not identify themselves as artists, but rather the motives for action is found from the themes and targets of popular culture, civic activism, and computer programming and software design subcultures. In particular, the youngest new media artists want to avoid the "artistic" label. They also want to get their works onto the Internet and in urban spaces rather than in a gallery or an exhibition context.

Although much of the work presented during the PixelACHE festival was released under a Creative Commons license, part of work was strictly copyrighted. According to Himanen

(2001, p. 53), the concept of ownership is different for open source developers than in, for example, the corporate world that pursues patents, trademarks, copyrights, and non-disclosure agreements. Castells (2001, p. 47) states that the gift culture is a dominating, working mechanism in the hacker world, where the inner joy of creation is the leading force and brings the culture close to the world of art. Still, the open source artists also hope to make a living from their art. According to Mäkelä (2002, p. 156), the new forms of economy are based on brands that are created in the networks, linked with software, projects, persons, and organizations. These forms are new in a sense that they are not built on mass production, but different models of distribution. If the copyright-based income is discounted, then what kind of income are open source artists looking for when working in the open source community?

According to my interviewees, many of the young members of the community hoped that the community would serve as an entry point for projects that generate income. In fact, this has happened during the 4 years of the development of the collective for many enthusiasts who have been employed in computer software firms. For young new media artists the festival has functioned as a demo and promotional scene for their work.

> *Often young artists are outside the circle and need a platform to show their talent. This is what our festival is trying to provide. For many of them, the only ways to finance the artistic work is a mixture of social benefits, jobs outside the new media sector, or low-paid projects within the new media sector that one can't live on.* [Artistic director informant]

In the long run, the artistic director informant stated, most of the artists of the network drop out and get a proper job, usually simultaneously with starting a family. They often split their work into "quick and dirty" projects that are done in order to get money and to "art projects that strive for enjoyment of joint creation and self expression," the artistic director informant explains. For young artists, the experience within the network, and in some cases also the status, was valuable, even though not many of them were able to continue artistic work, but rather turned to basic computer design work. Still, there is hope that the work done under Creative Commons licenses remains viable and might end up in a commercial environment and generate at least a little income.

For the young new media artists, the motives are often to show their talent and projects in order to find employment, although this did not seem to be a typical outcome, at least not yet. Some of the artists used social benefits (unemployment allowance and general housing allowance) to cover their daily expenses and felt that the public allowances are their "salary" for working in the new media open source art field.

CONCLUSIONS

The open source ideology and method is an interesting concept when viewed within the field of new media artists. On the basis of this exploratory study, the PixelACHE artists seem to share the ideals of the open source-based, software-oriented hacker culture of openness, joint creation, and collaboration through Internet-based groupware practices. The PixelACHE network was considered open, even though the artistic director controlled the growth of the

network and wanted to know personally all the members of "his" network. Also, the artists of each artistic project usually knew each other already before the cooperation began. From this perspective, the creation forum seemed not to be open to just anybody, but to those who had earned trust and credibility through previous projects. The end results—artistic artifacts— were primarily openly distributed under Creative Commons licenses, so the open source ideology was most commonly adapted as a more liberal distribution than as joint creation with anyone wanting to join in the creative process.

The open source artists in this study see the traditional, highly legislated, author-based copyright tradition as old-fashioned, and felt that it is important to create a more open concept of property that makes it easier to use and distribute artistic work. This would be also an important step towards open source-based art that could benefit Internet users more widely. The ethic is similar to one of science: New ideas are openly distributed for others to comment on or further develop. This tradition could serve as a fertile ground for artistic innovations as well. However, if copyright and the matters of authorship are rethought, the open source artists face the challenge of finding an alternative avenue for income. At this point, the strategy for most artists was just to be employed somewhere and use the open source platform as a playground for artistic ideas.

In the case of the PixelACHE network, I found four groups of artists that differ in the way of financing their open source-based art in the new media network. The key person of the festival fit Castells' (1996, p. 415) idea of managerial elites. He was cosmopolitan and funded much of his work through consultancy and lecturing fees. For him, the network was part of his credibility image, which was also essential when he applied for personal artistic grants. It is notable that the project-based, hired event managers did not fit the category of managerial elite. The second and third group contained those who earn their main income in public institutions or the corporate world. For them, the PixelACHE network served as a meeting platform—a playground where they can join others, develop artistic ideas, stay updated on what is going on in the field of experimental new media that may have implications for their day jobs, and have fun creatively. For the public sector employees the PixelACHE provides a demonstration platform for work often developed at least partially as part of their day jobs and often realized under a Creative Commons license. The corporate sector employee's work is copyrighted and the volunteer-based PixelACHE development work is mostly released under Creative Commons licenses. The fourth group consists of those who put a great voluntary effort in the community, but live on social benefits or freelance-based "quick and dirty," on-off projects that are organized just to earn some money. For them, the network served as a meeting place and they also hoped that the connections and possibility for introducing their artistic work would lead to new projects and employment. For most of the members who fall under the fourth category, activity in the network does not last very long because they are often forced to make their living outside of the new media sector. At the same time, they share high motivation on the development of work that might be beneficial for society in terms of the common good.

A challenge for society is to direct at least part of the open source artists efforts to benefit society as social hackerism. Still, the lack of opportunity for income is a big obstacle. As long as voluntary, unpaid work is the only option for young new media enthusiasts, their creative contribution to the society remains untapped to its full potential.

_____

ENDNOTES

1. More about the GPL and copyleft method at http://www.gnu.org/gnu/thegnuproject.html
2. For more information on Project Gutenberg see http://www.gutenberg.org
3. One famous site is www.fanfiction.net, where, for example, Sherlock Holmes solves over 500 new mysteries and the Star Wars has over 8800 new stories voluntarily written by fans
4. The Web site http://wikipedia.org/ publishes articles written by volunteer authors in over 30 languages, including lesser languages such as north Samic and Wolof
5. For more information on READ_ME, see http://readme.runme.org/
6. For more information on Piksel, see http://www.piksel.no/
7. For more information on MAKE ART, see http://makeart.goto10.org/2006/
8. For more information on Dorkbot, see http://www.dorkbot.org/
9. For more information on OpenLabs, see http://www.pawfal.org/openlab/
10. For more information on dyne:bolic, see http://www.dynebolic.org/
11. For more information on Kingdom of Piracy, see http://kop.fact.co.uk/
12. The PixelACHE archive is accessible at http://www.pixelache.ac/archives

REFERENCES

Bettig, R. (1996). *Copyrighting culture: The political economy of intellectual property*. Boulder, CO, USA: Westerview Press.

Bollier, D. (2003). *Silent theft: The private plunder of our common wealth.* New York: Routledge.

Castells, M. (1996). *The information age: Economy, society and culture; Vol. 1. The rise of the network society.* Oxford, UK: Blackwell.

Castells, M. (2000). *The information age: Economy, society and culture; Vol. 1. The rise of the network society (2nd ed.).* Oxford, UK: Blackwell.

Castells, M. (2001). *The Internet galaxy: Reflections on the Internet, business and society*. Oxford, UK: Oxford University Press.

Castells, M. (2005). *Innovation, information technology, and the culture of freedom: The political economy of open source*. Presentation at the 2005 World Social Forum meeting, Porto Alegre, Brazil. Retrieved February 2, 2006, from http://www.openflows.org/article.pl?sid=05/01/31/2028221

Creative Commons UK. (2005). Retrieved July 6, 2006, from http://www.creativecommons.org.uk/

DiBona, C., Ockman, S., & Stone, M. (Eds.). (1999). *Open sources: Voices from the open source revolution*. Sebastopol, CA, USA: O'Reilly Publishing.

Duelund, P. (2003). *The Nordic cultural model.* Copenhagen, Denmark: Nordic Cultural Institute.

Feller, J., & Fitzgerald, B. (2005). *Understanding open source software development*. London: Addison-Wesley.

Fink, M. (2003). *The business of Linux and open source.* Upper Saddle River, NJ, USA: Prentice Hall.

Frith, S., & Lee, M. (Eds.). (2004*). Music and copyright (2nd ed.)*. New York: Routledge.

Harris, H. (2002). Uusmedia kaupunkikulttuurina; Verkostoja ja solmuja [New media as urban culture; Networks and nodes]. In M. Tarkka & T. Mäkelä (Eds.), *Uusi mediakulttuuri innovaatioympäristönä: Kotimainen ja kansainvälinen tutkimus* (pp. 63–74). Helsinki, Finland: m-cult.

Himanen, P. (2001). *Hakkerietiikka ja informaatioajan henki* [The hacker ethic and the spirit of the information age]. Helsinki, Finland: WSOY.

Ingo, H. (2005). Avoin elämä; Näin toimii Open Source [Open life; This is how open source works]. Retrieved December 2, 2006, from http://www.avoinelama.fi/pdf/AvoinElama-press.pdf

Lessig, L. (2004). *Free culture: How big media uses technology and the law to lock down culture and control creativity.* New York: Penguin Press. Also available on-line; retrieved July 22, 2005, from http://free-culture.org/freecontent/

Litman, J. (2001). *Digital copyright*. New York: Amherst.

Manovich, L. (2001a). *The language of new media.* London: MIT Press.

Manovich, L. (2001b). Models of authorship in new media, an updated new version of Chapter 3 of the book *The language of new media*. Retrieved July 22, 2006, from http://www.manovich.net/DOCS/models_of_authorship.doc

Mäkelä, T. (2002). Mediakulttuurin innovaatioympäristöt [New media culture as an environment for innovation]. In M. Tarkka & T. Mäkelä (Eds.), *Uusi mediakulttuuri innovaatioympäristönä. Kotimainen ja kansainvälinen tutkimus* (pp. 153–160). Helsinki, Finland: m-cult.

Mäkelä, T. & Tarkka, M. (2002). *Mediataide: Kotimaiset toimijat ja kansainväliset mallit* [Media art: Finnish actors and international models]. Helsinki, Finland: Ministry of Education. Also available on-line; retrieved December 2, 2006, from http://www.minedu.fi/export/sites/default/OPM/Julkaisut/2002/liitteet/opm_390_mediataide.pdf?lang=fi

Raymond, E. (2000) *Homsteading the noosphere, Version 3.0.* Retrieved on July 7, 2006, from http://www.catb.org/~esr/writings/cathedral-bazaar/homesteading/

Raymond, E. (2001) *The cathedral & the bazaar: Musings of Linux and open source by an accidental revolutionary.* Sebastopol, CA, USA: O'Reilly Publishing.

PixelACHE. (n.d.). About PixelACHE Festival. Retrieved on May 8, 2005, from http://www.pixelache.ac/2005/about-pixelache-festival/

Rosen, L. (2004). *Open source licensing: Software freedom and intellectual property law.* Upper Saddle River, NJ, USA: Prentice Hall.

Tarkka, M. (2002). Mediakulttuurin kotimainen toimiala [Finnish media art field]. In M. Tarkka & T. Mäkelä (Eds.).*Uusi mediakulttuuri innovaatioympäristönä. Kotimainen ja kansainvälinen tutkimus.* (pp. 19–34). Helsinki, Finland: m-cult.

Weber, S. (2004). *The success of open source.* Cambridge, MA, USA: Harvard University Press.

All correspondence should be addressed to:
Katri Halonen
Faculty of Culture
Helsinki Polytechnic
P.O. Box 4040
00099 City of Helsinki
katri.halonen@stadia.fi

REVIEWERS FOR 2005-2006

We would like to thank the following individuals who reviewed manuscripts for *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments* in 2005-2006.

Julio Abascal
Kristina Andersen
Caroline Bassett
David Benyon
Eleni Berki
Stefan Bertschi
Jon Bird
Vera Blahová
Mark Blythe
Kirsten Boehner
Annica Bragd
Johanna Bragge
Chris Byrne
Scott Campbell
Jose Cañas
Ludwik Chang
Neil Charness
Luigina Ciolfi
Richard Coyne
Fiorella de Rosis
Andy Dearden
Maria Dementieva
Jonathan Donner
Rick Downing
Nicola Döring
Dave Edyburn
Anneli Eteläpelto
Janet Finlay
Hans Geser
James Gips
Klaus Grunert
Nestor Garay
Leslie Haddon
Richard Harper
Mark Hartswood
Mervi Hasu
Pat Healey
Sacha Helfenstein

Claes-Fredrik Helgesson
Jeannette Hill
Hans Hummel
Pertti Hurme
Päivi Häkkinen
Joachim R. Höflich
Hanna-Kaisa Isomäki
Marja Järvelä
Aki Järvinen
Marjatta Kangassalo
Marja Kankaanranta
Sara Ketley
Sirkku Kivisaari
Hans Kjellberg
Ilpo Koskinen
Tommi Kärkkäinen
Peter Lauritsen
Turo-Kimmo Lehtonen
Clayton Lewis
Ann Light
Richard Ling
Pirjo Linnakylä
Sara Ljungblad
Petri Lounaskorpi
Heikki Lyytinen
Anna-Maija Lämsä
Petri Maaranen
Catriona Macaulay
Lina Markauskaite
Sorin A. Matei
John McCarthy
Jim McGuigan
Gustavo Mesch
Gretha Mitchell
Andrew Monk
Jari Multisilta
Anja Mursu
Raquel Navarro

Kalevi Nevala
Marketta Niemelä
Shaleph O'Neill
Antti Oulasvirta
Mika Pantzar
Neil Pollock
Simon Polovina
Graham Pullin
Patrick Rau
Darren Reed
Harald Rochracher
Mikko Ruohonen
Inge Røpke
Tarja Salokoski
Antti Salovaara
Kerstin Severinson Eklundh
Martti Siekkinen
Sarah Skerratt
Andrew Skuse
Roger Slack
Michael Smyth
James Stewart
Howard Sypher
Sakari Taipale
Päivi Timonen
Sari Tuuva-Hongisto
Jayne Wallace
Hans van der Heijden
Gerrit van der Veer
Signe Vikkelsoe
Brit Ross Winthereik
Alexander Voss
Peter Wright
Jouni Välijärvi
Seppo Väyrynen
Yutaka Yoshinaka
Simon Yuill