Interactive Education: Transitioning CD-ROMs to the Web

Michael Mascha and Gary Seaman

Department of Anthropology, University of Southern California, Los Angeles, California

CD-ROM publishing of interactive multimedia has generally taken the model of the printing press and transferred it into the new digital medium. Even when presented as interactive multimedia, the content itself is frozen in time and not updatable. This is frustrating since a new CD-ROM becomes old hat as soon as it is pressed.

More than a year ago we integrated most of Jane Goodall's fieldwork amongst the chimpanzees in Gombe National Park, Tanzania into a CD-ROM title using sound, images, video, text together with an intuitive and explorative interface. In teaching courses with "Virtual Chimps" as we called it, we soon discovered that CD-ROMs are an island solution far removed from what we envision as a global knowledge system. Until the time when all knowledge in all media can be accessed over networks, a hybrid system is desirable which makes the transition from CD-ROM published titles to information accessed over networks.

We have therefore produced a CD-ROM which contains our software engine to analyze chimpanzee behavior but also anchors to the WWW using Mosaic as client. With this configuration and linkage to our own fileserver, our CD-ROM works as a hybrid system: it performs customized tasks on a local workstation but is able interchange and integrate data with other WWW file servers. The output of any analysis can be shared with other users over the WWW and additional information gathered world wide can be integrated seamlessly into the system.

•

The authors firmly believe that Visual Anthropology is an apical ancestor of multimedia scholarship. Anthropologists have conventionally recorded the diverse cultural heritage of humankind by means of varied media: written text, graphics, film, sound and still images, as well as three dimensional objects and even performance skills. Generations of anthropologists have employed motion picture film to record and represent the diversity of human cultures across the globe.

But because the university in general accepts only written texts as truly academic publications, much of "visual anthropology" has been routinely devalued by university boards of merit review. Even the pioneering efforts of anthropologists like Franz Boas (1917), Bateson and Mead (1936-38, Mead 1977) or Timothy Asch (1971, 1975) to put filmed ethnography in the mainstream of anthropological forms of representation were resisted and marginalized within academic anthropology, for the very rational reason that linear media like films lack the conventional scholarly apparatus of indexes, references, etc. (Biella, 1993a)

When in the middle 1980's "interactive multimedia" emerged as a potential new form of publication via CD-ROM technologies, we in visual anthropology began to think about how this conjuncture might impact academia's attitudes about the intellectual value of our discipline. (eg. Howard 1988) At that same time the Ethnographics Laboratory was established at the University of Southern California to index and research large amounts of film footage from China and Taiwan. A hypercard program was developed that could be linked to videotape transfers from film. At first, these images were manually linked to timecodes displayed in window dubs of the master tapes. Although clumsy and time-consuming, this system made it possible to link film "hypertextually" with a research database created in the three

scholarly languages of Japanese, Chinese and English. Thus Seaman and his collaborator Homer Williams were able to begin to build a "scholarly apparatus" that linked, however clunkily, text and image within a single system of access and display.

•

When Jane Goodall joined the anthropology faculty at USC in 1989, Seaman proposed to her that an archival system based on videodisk should be developed to allow scholars to analyze visual recordings of chimpanzee behavior. It was decided to try to put all the data ever collected in whatever media at the Gombe chimpanzee community into a single, integrated research archive. At the time, it was felt that digitization technologies were at least a decade away from providing the quality and economy of videodisk recordings of behavior, so a hybrid analog/digital system was decided upon. The Jane Goodall Research Center still uses videotape as its primary archiving medium, but videodisks have now been replaced by digital transfers to CD-ROMs for the front-end of the multimedia archive.

In 1992, Michael Mascha came from Vienna to work together with Seaman and Williams at USC's Center for Visual Anthropology. The group decided to begin experimenting with a "framegrabber" video board and we have now completed a CD-ROM with representative frames of over 150 hours of videotape recordings, all of which are seamlessly linked with shotlog data and other contextualizing information. After some initial misgivings about the feasibility of getting fullmotion video to work on the platforms then available, a decision was made in early 1993 to leave the analog/digital hybrid behind and move to a fully digital system. As the result, at the opening of the Jane Goodall Research Center on May 7, 1993, we were able to demonstrate a CD-ROM program entitled "Virtual Chimps" that integrated information derived from stills, audio recordings, video, film, graphic art, and text into a single digital format: a system of presenting chimpanzee behavior conceived as computer courseware that incorporates fullmotion video within an analytical framework and relevant scholarly apparatus.

The "relevant scholarly apparatus" is important because it allows us to address the main objection that academics hold against media publications: given that film/video/audio or any performance media are unilinear modes of representation, it has hitherto proved almost impossible to provide them with the critical notes, analytical structures and abstractions, and most important of all, the intellectual pedigrees embodied in the bibliographies and reference sources of printed books, scholarly articles and other text-based publications. Virtual Chimps and our other CD-ROM titles address this shortcoming in performance genres by presenting linear behavior sequences as though suspended within an electronic scholarly apparatus.

•

A concept which is very important in our software design is the separation of the data *per se* from the structural or interpretative "overlays" that function to mediate the user's access to the data.   This act of separation of data from structure or form from content is equivalent to an act of deconstruction or ultimately of analysis. What we mean by separating the data "per se" from its structure can be best illustrated by an example from the field of visual anthropology.

A documentary film is usually perceived by its audience as consisting of "the data" (i.e. the audiovisual recording components or visuals and sound track elements) structured by "montage "   (i.e. the editing/comment/narrative decisions of the filmmaker) that in combination result in a linear or narrative film.   Of course, the audiovisual components also instrinsically exhibit a structure, as for example, the compositional artifacts of the cinematographer or the behavioral patterns and/or

idiosyncracies of the subject(s) of the film. Still, the audience experiences the film performance as a dialectic of form and content.

The transposition of such a film performance from an analog to a digital performance allows the easy severing of the unity of form and content. This simple act of deconstruction, of uncoupling the constructed unity of a linear, time based performance, results in the creation of a new genre of performance that we may call a "nonlinear film." This is because the surgical separation of the filmic elements lays them open to componential analysis by suspending the time based presentation. Yet the preservation of the filmmaker's edited version as a set of software instructions allows the instantaneous resumption of the linear performance mode. What is achieved is a kind of "virtual" performance genre that phases effortlessly between time based and nontimebased modes of representation. (Seaman and Williams 1993) The results of this simple deconstruction have some important implications for education and research.

One of the most important of these implications is that the entire corpus of all media, especially time based recordings, need not be "edited" in any physical sense because the access time for any given unit of information is below the threshold of human perception. The only remaining rationale for "editing" in the sense of abstracting actual "clips" or "segments" of information is an economic one: transaction frictions (or conversely, storage costs) are too high and some subset of the original data must be imported into a local setting. The upshot is that "pieces of time" should be made available to users to the fullest extent of their original collection; interpretations or editorial decisions about representation of the data will therefore have to compete with each other because they will exist in the same space relative to the "data." (Saffo 1994) Interpretations can literally be re-searched; editorial decisions of linear representations of events can be deconstructed and then reconstructed with equal celerity.

If a prevailing interpretation is displaced, outdated or new research material has been collected, then a study published as a CD-ROM title is no different from a book which is outdated as soon as it is printed. The same principle holds for almost all forms of publication today: no mechanism exists for the constant updating of the work to encompass relevant shifts in the interpretive framework or additions to or corrections of the database. Publication implies a finality that is derived from the time based limitations of analog media but which is no longer justified in interactive and updatable modes of a digital world.

•

As soon as we had created Virtual Chimps as a CD-ROM title, we began to experiment with its use in classroom settings and for student research projects. CD-ROMs have rapidly evolved into an important part of our teaching strategy at USC and we anticipate an ever increasing number of titles and topics will be deployed in the immediate future. The advantages of CD-ROM based educational software are obvious. They are an inexpensive way of mass producing and distributing 650 MB of data and are becoming the standard format for interactive multimedia titles. At first, we and our students were elated by the prospects for this exciting new learning format. It was only when we began to gain experience with using CD-ROMs that we came to a realization of their limitations.

CD-ROMs are frozen in time and thus the user has available only the limited set of information allowed by the storage capacity of the disk. While enormous amounts of text can be placed on a single CD-ROM, even jukebox arrays cannot adequately store enough time based media to satisfy requirements for a whole course of study. In addition, CD-ROMs are not directly updatable or upgradable: newly available information or a change in conceptual, theoretical, or methodological approach cannot be accomodated in a disk which is not rewritable. CD-ROMs are also not perceived as integrated with the rest of the world via the flux and flow of time; the CD-ROM once pressed becomes an isolated artifact while the world "out

there" remains apart. This separation is reinforced psychologically by the lack of a mechanism to rewrite or update and by the economies and frictions of transactions: presently the only viable strategy of modification is to buy a "new edition" and physically replace the "old edition."

Our students wanted to know more than could be accomodated on a single CD-ROM like Virtual Chimps. They wanted to know not just what kind of research we were doing at USC, but what scholars elsewhere were up to and what were other points of view. They wanted to hear about new discoveries and to know what kinds of ecological and political issues surrounded the efforts of Goodall and others to "save the chimps." Given the remoteness, topicality and even ephemeral nature of much that our students wanted to know about the context of their studies, we decided that it was necessary to create an environment where students could themselves launch "expeditions" to study chimpanzees.

Given the constraints of time, energy and other resources, we decided the most practical way to mount such explorations was via the internet. But since our students' starting point was an "isolated artifact", we had to conceive of how such an artifact could function as the launching pad for student exploratory expeditions. Our solution was to rewrite our CD-ROM in such a way that "hooks" embedded in the information would facilitate the student's navigation of the virtual libraries and research databases of the world, no matter how remote or close at hand.

•

We believe that the WWW can allow us to provide our students with an environment for our CD-ROM titles that in turn allows our students to extend their grasp of understanding out into the knowledge base of the wider world. As Ted Nelson foresaw almost a quarter century ago, hypertext and hypermedia combined with a continuously updating electronic network will create the ultimate pleasure dome: a kind of collective soul of humanity derived from the existence of a common fund of knowledge equally available to all. It is rather ironic but perhaps apt that he should have selected Xanadu, site of an remote imperial institution forbidden of access to all but the chosen few, as the expressive metaphor for his vision. (1974:142-148)

Yet Xanadu exists in the present as the WWW. At USC's Ethnographics Laboratory we have already set up a file server (http://elab.server.usc.edu/) on the WEB which allows our CD-ROM users to integrate information we provide on our server with their titles. We achieve this in the following manner: The information is archived by first separating the audiovisual components, which often make up more than 95% of the data on a CD-ROM, from the other information on the CD-ROM. Audiovisual Information is still best distributed on CD-ROM because general network bandwidth still does not allow transmission of 0.6 GB in reasonable time and without jamming traffic for other users. CD-ROM is also still the storage medium of choice since it is very economical when considered in relation to access time.

On top of the audiovisual and other information in the CD-ROM sits our software engine whose purpose is to *make sense* out of the "raw" data inputs. This engine consists of different sets of digital information that can all be economically related to any specific behavioral event as well as set in the context of all relevant observations by other workers. Finite digital audiovisual recordings of behavior are selected as archetypes of named categories, then additional instances are framed with onset/cessation boundaries to serve as a baseline for comparison with other behavioral sequences that potentially can be included within the category. By translating the audiovisual recordings into digital format, and then analytically defining the instances of behavior by in and out points within a behavioral continuum, the context of microbehaviors is preserved for other workers to reanalyze, reinterpret and quite literally re-search.

The engine is also aware of the outside world through WWW connections. Our interface design includes a WWW "update button," which launches Mosaic while

the engine continues to run in the background. This operation establishes a connection to a homepage appropriate to the CD-ROM title. The user then chooses from the available options of updatable material and downloads them to the hard drive. As soon as Mosaic is closed, our engine integrates the new data (text/images/sound/video/etc.) into the representational system.

This effectively means that the structural parameters of the information on the CD-ROM are also applied to the data newly received over the web. The net result is an apparent seamless integration of information external to the CD-ROM with resident data. Our CD-ROM is no longer an artifact external to the ongoing stream of events "out there," but has become a constantly evolving organism within a worldwide environment of information.

•

As an example of how this CD-ROM-WWW hybrid works, we have constructed the following scenarios appropriate to such a version of our Virtual Chimp CD-ROM title.

1. Electronic publication of scholarly articles and databases over networks has been a long established procedure. It might even be argued that exchange of scholarly and research data is the basic raison d'etre behind the existence of most client-server systems. New scholarly information is constantly available over these electronic networks, and it is a simple matter to search the specific addresses of such resources via an intelligent agent for new "breakthrough" publications appropriate to chimpanzee behavior. When such a publication is located via key words or other search mechanisms, the article is integrated into the appropriate structural relationship to the CD-ROM data. The engine automatically "massages" the new data so that its interface characteristics are the same as those for the CD-ROM itself.

2. The Jane Goodall Research Center is also located in the Department of Anthropology at USC, and the Ethnographics Lab server maintains a section of the homepage devoted to updates received on a regular basis from the fieldworkers among the chimpanzees in Gombe National Park, Tanzania. Demographic changes make up one of the most important items of interest to research on the community, and the birth or death of a single individual can have very important consequences for the viability of the population. News of this sort can be easily integrated by the engine into the onscreen displays.

3. Methodological refinements and conceptual reorientations are constantly redefining scholarly domains and objects of study. In the field of primate studies, for example, current scholarship is focussed on optimal foraging strategies, inclusive fitness questions, machiavellian intelligence, etc. (Burton 1993) If a shift in the research paradigm of primatology were to create a new object domain, then a new methodological approach might be developed that would also have to be integrated into the Virtual Chimps title. A new and more relevant ethogram could easily be applied to the CD-ROM resident data to actualize the new methodology and thus more adequately reflect its object of study.

These exemplary scenarios show how the CD-ROM-WWW hybrid can function to compensate for present shortcomings in both of the system components, yet function synergistically so that the user is aware only of the combined efficacy of both.

•

In future we would like to build our own client into our CD-ROM resident engine based on Mosaic to further integrate our engine with the WWW. Another priority is to make the information flow bidirectional, so that our CD-ROM can become a server on the WWW itself. Our engine is a generalized one for behavioral analysis: somewhere on the web out there might very well be parties interested in parallel or complementary research that could be made directly comparable through the use of our analytical engine. We are presently working with primatologists such as Barbara Smuts (1986) and other anthropologists to develop a common "look and feel" to the interactive interfaces that must be created in order for WWW to realize its ultimate potential.

We foresee a not too distant time when more and more of the audiovisual and other dense data is distributed over the WWW itself. Eventually the web will reach everywhere: Xanadu will have been transformed from the elite capital of arcane hackers beyond the pale into realization as a thousand points of light. When this happens, the transitioning of the isolate CD-ROM into WWW as an electronic version of the"soul of knowledge" will be complete.

Although this printed version of our paper is already obsolete, you can read the current redaction on the WWW at "http://elab-server.usc.edu/papers/www94.html" via the normal channels.

•••

References and Bibliography

Asch, Timothy. 1971. Report from the Field: Filming the Yanomamo in Southern Venezuela. *American Anthropological Association, Program in Ethnographic Film Newsletter* 3, 1: 3-5.

Asch, Timothy. 1975. Using Film in Teaching Anthropology: One Pedagogical Approach". In *Visual Anthropology*, Paul Hockings (editor), pages 385-420. The Hauge: H. Mouton & Co.

Bateson, Gregory and Margaret Mead. 1936-38. *Childhood Rivalry in Bali and New Guinea*. 16mm film. NY: New York University Film Library.

Biella, Peter. 1993a. Beyond ethnographic film: hypermedia and scholarship. In Rollwage, Jack (ed) *Anthropological film and video in the 1990s*, pp. 131-176. Brockport, NY: The Institute Press.

Biella, Peter. 1993b. The design of ethnographic hypermedia. In Rollwage, Jack (ed) *Anthropological film and video in the 1990s*, pp. 293-342. Brockport, NY: The Institute Press.

Burton, Frances D. 1993. A multimedia introduction to the primates. In Boonzajer Flaes, Robert M. and Douglas Harper (eds) *Eyes Across the Water: Two*, pp 133-141. Amsterdam: Het Spinhuis.

Howard, Alan. 1988. HyperMedia and the Future of Ethnography. *Cultural Anthropology* 3,3:304-315

Jacknis, Ira. 1990. James Mooney as an Ethnographic Photographer. *Visual Anthropology* 3,2-3: 179-212.

Mead, Margaret. 1975. Visual anthropology in a discipline of words. In Hockings, Paul (ed) *Principles of Visual Anthropology*, pp. 3-10. The Hague: Mouton

Macfarlane, Alan and Martin Gienke. 1989. The Principles Used in Selecting, Editing and Transferring Materials for an Archival Videodisc. *Journal of Educational Television* 15,3: 131-141.

Macfarlane, Alan. 1990. BBC Domesday The social construction of Britain. *Society for Visual Anthropology Review* 6,2: 25-41.

Nelson, Ted. 1974. *Dream Machine; Computer Lib*. Revised Edition 1987. Redmond, WA: Tempus Books.

Nielsen, Jakob. 1990. *Hypertext and Hypermedia*. NY: Academic Press.

Saffo, Paul. 1994. It's the context, stupid. *Wired* 2,03.

Scherer, Joanna Cohan (ed). 1990. Historical Photographs as Anthropological Documents A Retrospect. *Visual Anthropology* 3,2-3131-155.

Seaman, Gary and Homer Williams. 1993. A multimedia introduction to the primates. In Boonzajer Flaes, Robert M. and Douglas Harper (eds) *Eyes Across the Water: Two*, pp 142-158. Amsterdam: Het Spinhuis.

Smuts, Barbara B. et al. (eds) 1986. *Primate Societies*. Chicago: Univ of Chicago Press.