

PathScape : Indexing Audio-Visual Digital Media

Mike Leggett

Creativity and Cognition Studios
University of Technology Sydney
Broadway, NSW 2007, Australia.

Mike.Leggett@uts.edu.au

+612 9514 2000

ABSTRACT

The contemporary burgeoning usage of digital movies, photos, audio and text, their distribution through networks both electronic and physical, will be considered in the context of a convergence of these media with a contemporary engagement with personal and community history.

An interactive experimental prototype, PathScape, will be described and evaluated and further practice-based research approaches to author-defined storage and retrieval systems will be outlined.

Author Keywords

Interactive, digital media, taxonomy, index.

ACM Classification Keywords

H5.2 User interfaces: user-centred design.

INTRODUCTION

In a recent longer paper I have discussed some aspects of interdisciplinary research into mind and memory, perception and cognition, presence and embodiment, philosophy and cultural theory, media representation, creativeness and meaning. These provide a context for appreciating an approach to investigating machine memory designed to store and retrieve digital audio and visual media.

The demonstration will describe and briefly evaluate the interactive experimental prototype, PathScape, and outline further practice-based research approaches to author-defined storage and retrieval systems for audio-visual digital media. I begin by summarizing the principle theoretical components of the system.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.
C&C '05, April 12-15, 2005, London, United Kingdom.
Copyright 2005 ACM 1-59593-025-6/05/0004...\$5.00.

TAXONOMY OF INDEXING

A taxonomy of indexing enables an overview of the topography of the system, by reducing scale and quantity to proportions that can be comprehended, particularly by new or inexperienced users. In many ways ideal for text-based data such as large ICT parallel database systems (8), such an approach for audio-visual data gives rise to considerations affecting the user of the system as well as the system's efficient technical functioning. Whilst a word index is admirable for locating traces within written language sources, "...keyword searching is a crude and unsatisfactory method for sampling the information content of complex sources...." (3) such as digital video.

LOCI SYSTEMS

The Greeks orators and rhetoricians, who before the alphabet had been handed down, developed an elaborate form of artificial memory, described so fully in Yates' *Art of Memory*. *Ars memoria*, "...a series of *loci* or places. The commonest, though not the only type of mnemonic place system was the architectural type We have to think of the ancient orator as moving in imagination through his memory building whilst he is making his speech, drawing from the memorised places the images he has placed on them." (11) Some may claim the first movies were a conceptual model made by the Greek rhetoricians, complete with wide shots, tracking shots, panning, tilts, close-ups and flashbacks, all played in the cinema of the mind's eye - 'classic film narrative'.

The story, the diegesis of cinema, was equally inexorable from beginning, through middle to end. In this, the age of the rhizome (6), linearity need not structure thought within the confines of logic and rhetoric. In the same way as the walk from home to the station may allow interventions of the everyday to structure the day itself, even enhanced by the imprecision of the visual cues that guide us during the walk, then too the invention or re-invention of a visual literacy based on digital video and 'machine memory' technologies, would enable us (with the happenstance of chance encounter), to employ indexing and classification appropriate to the task in hand.

"Clark (2) and Hutchins (7)... and others, have argued that just as basic forms of real-world success turn on the

interplay between neural, bodily and environmental factors, so advanced cognition turns – in crucial respects – upon the complex interplay between individual reason, artifact and culture. ...

PATHSCAPE

The prototype has an interface and navigation system giving access to 'narratives' by their association with a specific place or location or series of locations.

The taxonomy is represented with images of contiguous cinematic space - individual photo images are pixilated to produce apparent motion in a forward direction, perceived as a movement 'into' the space recorded, a landscape. The movement is achieved by gesture, using a mouse in the prototype.

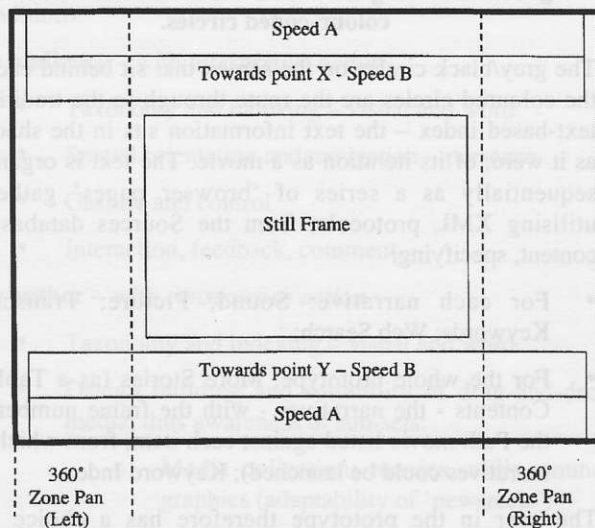


Figure 1: Screen Cursor Areas and Gesture Outcomes

In Figure 1, a gesture with the cursor to the top of the screen launches the movie of movement through the landscape, as in a cinema Point-of-View (POV) tracking or dolly shot. By gesturing with the mouse to return the cursor to the centre of the screen, movement will cease. By continuing the gesture to the bottom of the screen, the image on the screen will be replaced by the view in the landscape visible 180° from the initial view - in other words 'behind' the POV of the initial image. By gesturing to top and then to bottom, the view through 180° can be instantly changed. By continuing the gesture to the bottom of the screen, apparent movement into the landscape will recommence, re-tracing as it were, the earlier steps. By gesturing further to edges of the screen, top or bottom, the motion 'into' the represented space will speed up by a factor of two.

Thus in the prototype it becomes possible to traverse the full distance of 'the walk' through the Bush, (X - Y in Figure 2), commencing at the low-water mark on the beach and ending in the rainforest three kilometers away. This takes about 40 seconds at double speed (approximately

50kph 'real-time' Speed A in fig.1) and 80 seconds at the slower Speed B (25 kph). At any point the movement can be halted and a return made along 'the Path'.

The taxonomy of the Path is ordered sequentially by three indexical devices. These are located in the border area that surrounds the central image of movement along the Path. Within this border are seen at various points, **fragments of images**, visible for short durations. These indicate a nodal junction which, when 'captured', by returning the cursor to centre screen thus halting all apparent forward movement, enables with a click, the launch of a movie to replace the image and sound of the Path. Thus along an X-Y axis are the 1, 2, 3, ... 8, 9 etc options, or *loci* 'in' which are stored the 'narratives'.

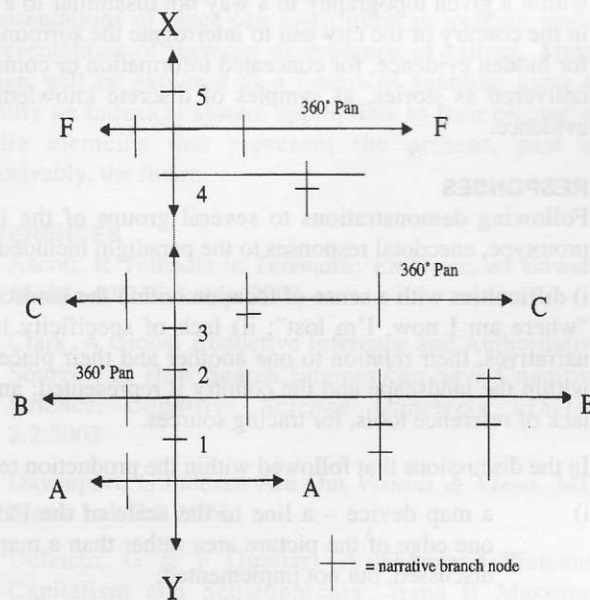


Figure 2: Schematic for accessing image/sound database

The second indexical device is the change in background **colour** to the border and background **sound** – these signify changes of zones. (Differences in ecology along the Path in this prototype). In Figure 2, these zones along the X-Y axis lie between the AA, BB, CC ... FF etc axes. By gesturing to the left of the screen (or to the right) within each zone will launch a 360° pan, a movie representation of the zone through which the user is currently 'passing' - to the right will pan right, to the left will pan left. Within the pan will be 'found' further nodes to launch movies storing more narratives.

In the prototype these 30 narratives range in duration from 20 seconds to 2 minutes, delivered in a range of presentational filmic genres, that associate this particular landscape with a range of narrative and non-narrative statements delivered as a movie, a slide show, or audio with user control of picture framing. At any time whilst a narrative plays, by dropping the cursor off the bottom of the

picture area, or clicking a red circle when one is visible, returns the sequence to the previous level and sequentially, back to the Path.

At the completion of a narrative, the third indexical device appears as a series of **circle shapes** that appear over the final frame of the movie. (Figure 3) Blue, yellow and brown and green circles function as 'buttons' to linked topics colour coded to symbolically represent a broad sort (in this prototype) under the descriptors: Anecdotes, Historical Context, Commentary and Analysis. Each option extends and develops the background of what has gone before, in effect narrowing the index path to the specific, reducing from the broad.

The encounter in this prototype enables the user to orientate within a given topography in a way not dissimilar to a walk in the country or the city and to interrogate the surroundings for hidden evidence, for concealed information or comment, delivered as stories, as samples of discrete knowledge or evidence.

RESPONSES

Following demonstrations to several groups of the initial prototype, anecdotal responses to the paradigm included:

- i) difficulties with a sense of location within the landscape – “where am I now, I’m lost”; ii) lack of specificity in the narratives, their relation to one another and their placement within the landscape and the country it represented; and iii) lack of reference tools, for tracing sources.

In the discussions that followed within the production team:

- i) a map device – a line to the scale of the Path, to one edge of the picture area rather than a map was discussed, but not implemented;
- ii) specificity of the media material employed to the indigenous community who were consulted, was readily acknowledged, but lay outside the scope of this initial experiment, that paradoxically deliberately sought to collapse the specificity of narrative and place;
- iii) the need to know where original cultural artefacts were archived was also an important observation made by the indigenous group, who were in the process of seeking to re-connect with their cultural heritage. This response led to a further development stage in the prototype.

FURTHER DEVELOPMENT

With the limited resources left to the development project at that stage, a text-based component to Pathscape was implemented. This would not compromise the initial intention of devising a visually-based indexing system as the choice to use text would be clearly indicated and separated from the visual path.

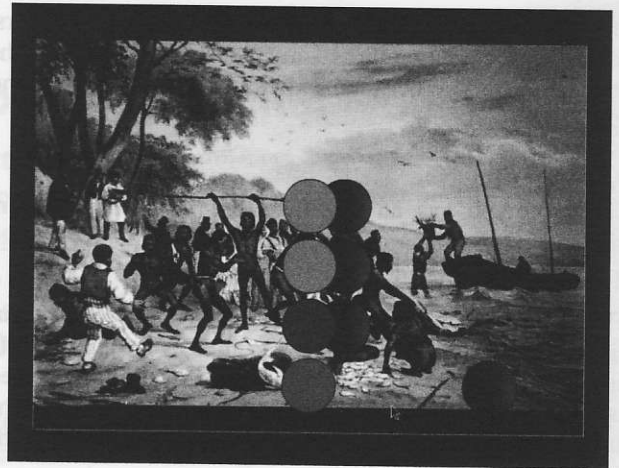


Figure 3: Screen grab within a narrative branch, with colour-coded circles.

The grey/black circles on the screen that sit behind each of the coloured circles are the route through to the traditional text-based index – the text information sits in the shadow, as it were, of its iteration as a movie. The text is organised sequentially as a series of ‘browser pages’ gathered, utilising XML protocols, from the Sources database of content, specifying:

- For each narrative: Sound; Picture; Transcript; Keywords; Web Search;
- For the whole prototype: More Stories (as a Table of Contents - the narratives - with the frame numbers of the Path movie listed against each item, from which the narratives could be launched); Keyword Index

The user in the prototype therefore has a choice - to navigate the index by using images and sounds, or by using words, or a mixture of both. The probable usefulness of the text feature in an educational context was also noted.

FURTHER RESEARCH

Pathscape is a project progressing through several stages and adopting several iterative forms. It could be delivered on disc (CD or DVD) or via the internet or broadband cable or conceivably, as it uses XML protocols, via a PDA or mobile phone. The software framework is dynamic, rebuilding the database at each launch, thus allowing on-going updates. With further research into the development of appropriate interfaces that help the author(s) define the ontology and epistemology of personal and collective memory, the Pathscape paradigm will find extended use for placing and retrieving audio-visual digital media artefacts.

At a later stage it may be appropriate to consider meta-design as an approach to developing the tool further. Fischer describes “...a fundamental objective of meta-design is to create socio-technical environment that empower users to engage in informed participation rather than being restricted to the use of existing systems.”(5) In such an event, this representational system will be open to

invention by its author(s) through the placement of appropriate media into the chosen taxonomic indexing system. Different modes of taxonomic representation could be suggested in such a scenario to provide ways of thinking about the representation of memory.

The representational system could be open to invention by its author(s) through the placement of appropriate media into the taxonomic indexing system, and further modes of taxonomic representation will be explored. The author(s) may not necessarily be wishing this to be for exposure to an audience, (anymore than diaries are for a wider audience), so there are many questions about evidence and its remembering in this way, that may need to be approached.

Initially the development will be practice-based evaluation of further prototypes that address the following issues and conditions:

the audience – with *interpretive action*

- Taxonomy and indexing – visual and word
- Spatial orientation and navigation – presence
- Gesture and control
- Interaction, feedback, comment.

the author – with *constructive action*

- Taxonomy and indexing – visual and word
- Design building and suitability of drag-and-drop media; thus awareness of sub-sets:
 - Media collection: movies, stills, sound, graphics (adaptability of 'newsreels')
 - Media composing: genres of address

database function / distributed systems – this 'engine' would be largely hidden, but configurable.

generic, proprietary, prototype system for access via:

- disc or
- network

related inter-disciplinary research and literature

- Mnemonic electronic devices – PDAs, mobile phones, etc
- Interactive sensor devices
- Theory and science of memory

This is a notional structure for defining questions to be delivered to the author by the system within the context of the meta-design of a system. The central 'problem' posed will be how will a sense of meaning flow from the process of ordering the author(s) audio-visual digital media?

As an expression of personal or communal culture, the resulting interactive artwork would in the words of Giaccardi, puts "... the tools rather than the object of design

in the hands of the users. It creates interactive systems that do not define content and processes, but rather the conditions for the process of interaction. These objectives correspond to cultural shifts in the emerging aesthetics of interactive art." (6) Or in the words of Roy Ascott "...an art that is emergent from a multiplicity of interactions in data space" (1)

CONCLUSION

We can anticipate a lot more images to be digitally authored and then consigned to the bottoms of drawers, for want of a means of retrieving their autobiographical or historical significance.

The Pathscape project will investigate, using practice-based research, means by which a system of indexing based on representations of place can assist users in locating media representations of memory or evidence of history. Meta-design will be explored as a means of enabling users to identify an indexical system appropriate to their placing of media elements that represent the present, past or conceivably, the future.

REFERENCES

1. Ascott, R Telenoia in *Telematic Embrace*, ed Edward Shaken, UC Berkeley. 2003
2. Clark, A Global Abductive Inference and Authoritative Sources, or How Search Engines can Save Cognitive Science. *Cognitive Science Quarterly* 115-140 2:2:2002
3. Davenport, G. Indexes Are Out *Visions & Views*, MIT Media Lab Fall 1996.
4. Deleuze, G & F Guattari 'A Thousand Plateaus: Capitalism and Schizophrenia', trans B Massumi, Minneapolis: University of Minnesota Press. 1994
5. Fischer, G Meta-Design: Beyond User-Centered and Participatory Design, *Proceedings of HCI International 2003*, Julie Jacko and Constantine Stephanidis (eds.), Crete, Greece, June 2003, pp. 88-92.
6. Fischer, G Giaccardi, E Meta-design: a Framework for the Future of End-User Development, in *End-User Development*, Lieberman, H Paterno, F Wulf, V (eds) Kluwer, Dordrecht 2004
7. Hutchins, E. *Cognition in the Wild*, MIT Press, 1995
8. Taniar, D Rahayu, W. A Taxonomy of Indexing Schemes for Parallel Database Systems, *Distributed and Parallel Databases*, 12, 73-106, Kluwer Academic Publishers. 2002.
9. Yates, F A. *The Art of Memory*, Pimlico, London 1966 (1992 edition)