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**Making Oral History Accessible
over the World Wide Web**

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Making Oral History Accessible over the World Wide Web

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Making Oral History Accessible over the World Wide Web

Summary

This paper describes a multimedia, WWW-based oral history collection constructed from off-the-shelf or publicly available software. Users search a full-text retrieval system based on the text transcripts to retrieve relevant transcript sections and their associated audio recordings and photographs.

Abstract

We describe a multimedia, WWW-based oral history collection constructed from off-the-shelf or publicly available software. The source materials for the collection include audio tapes of interviews and summary transcripts of each interview, as well as photographs illustrating episodes mentioned in the tapes. Sections of the transcripts are manually matched to associated segments of the tapes, and the tapes are digitized. Users search a full-text retrieval system based on the text transcripts to retrieve relevant transcript sections and their associated audio recordings and photographs. It is also possible to search for photos by matching text queries against text descriptions of the photos in the collection, where the located photos link back to their respective interview transcript and audio recording.

Introduction

At present, many oral history collections are only minimally accessible to researchers, students, and interested members of the public. Generally interviews are recorded on audio tapes, which are difficult to scan through for passages of interest. Further, the tapes themselves are usually only available for reviewing within the physical library or repository that houses the collection. Given these barriers to accessibility, many carefully (and expensively) created oral history records remain under-utilized, or even languish completely unanalyzed and unheard.¹

Recently a number of projects have provided searchable interfaces to transcripts of interviews, or brief interview descriptions, using a commercial database or text retrieval system (see, for example, Jones-Randall and Commings).^{2,3} These systems can be significantly easier to search than paper-based collection descriptions, as they generally offer fielded searching (by subject, interviewee, date, etc.) as well as free text searching over a summary record for each interview. Additionally, these systems can easily be set up so as to allow off-site users search access by modem or over the Internet. Once a potentially interesting interview is located, however, these simple searchable catalogs still force the listener to retrieve physical audio tapes.

Digitized interview tapes can be stored on disk with their associated database records, making the audio files more readily retrievable for listening for both on-site and distance users. In the absence of timing information from the tapes, however, the retrieval system can only return the audio file for the entire interview—again, forcing the user to step through the file serially to locate passages of interest. An improvement is to build a

chronological index that cross-references text transcripts to their respective portions of the audio recordings.

Our solution to the problem does just that, using off-the-shelf products and publicly available software for search and retrieval tasks, combined with short, specially written utility software that automates the collection building process as much as possible. Furthermore, our solution integrates with the Greenstone software, which was developed at Waikato to provide WWW access to text-based digital libraries.^{4,5} Not only does this architecture permit the multimedia data to be seamlessly distributed over a number of computers, but the information is accessible internationally at any time of day.

In this paper we first describe how the on-line data was generated from the source documents and integrated to form a digital library resource. Then we demonstrate, through example searching activities, the enhanced capabilities of the on-line collection. Finally we analyze the time taken to build the collection and conjecture about future trends.

Building the collection

Our source material for this project comes from an oral history project supported by the local Hamilton Public Library (Hamilton, Waikato District, New Zealand). This oral history collection focuses on youth culture in the district from 1930–1960. Local volunteers conducted semi-structured interviews with residents of the region, and recorded them on audio-cassettes. From those tapes, a brief (approximately 1500 word) summary of each interview was developed by the interviewer, with each summary divided into sections reflecting themes or events covered in the interview. The descriptive section labels are not standard, and vary widely across the items in the

collection. In addition to the summaries, copies were made of any photographs or newspaper clippings contributed by those interviewed. Examples of this source data are shown in Figure 1.

The first task to building the on-line collection was to acquire a digital copy of all source documents. Text summaries were already available as Microsoft Word documents; however, these were re-saved as HTML documents as this format is more convenient for access over the World Wide Web. Photos were scanned and saved as GIF^α images using PhotoShop. Audio tapes were digitally encoded using RealNetworks' RealAudio package; the RealAudio format not only compresses the size of the audio recording but also supports audio "streaming" over the Web (so that audio recordings begin playing as audio data is received, rather than forcing the listener to wait for the entire file to be download).

Background

Born Putaruru, 19 May 1930. Father came to Putaruru from Hamilton for work in timber mills, especially TTT (Taupo Totara Timber Company) which had acquired native bush south of Tokoroa and was growing at a remarkable rate. TTT put a private railway line in to Mokai. Father worked as a machinist in mills, and the family lived in one of the 8 "mill houses" in Putaruru. Grandfather worked developing 150 acres of land. Home life regulated by farming and mill.

Lived at home until 27 years old, except one year in the South Island during an apple picking season with a friend. Married at 31 years old.

"Everybody knew each other"

Refers to Vicki Scherer's book: "Putaruru : home of the owl"

Effects of War on life

Vaguely remembers Putaruru becoming a borough with 1,000 people in 1944. Biggest event was VE Day, when everyone went out in streets and "yahoed". Recollects being chastised for taking blackout paper off windows during war.

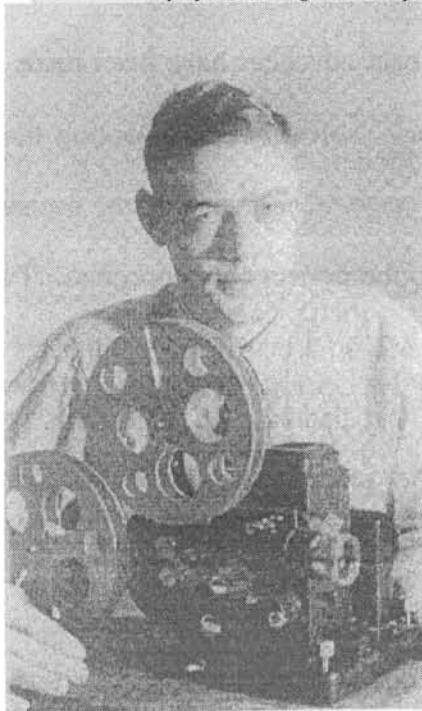
Social life restricted because of petrol rationing. Rationing affected the cost of things. Mother stayed home, and made clothes. School trousers made by mother were lined with flour bags.

Socialising

"Looking back now they probably sacrificed quite a great deal for the slight enjoyment that we had as children which was going to the matinee at the pictures and looking forward to that each week on a Saturday afternoon, not so much for whatever the picture was, but for the serial of Flash Gordon"

Didn't realise until later but father only had 3 days work per week before the war. Didn't seem to miss out on anything.

What they called a party night then was quite different from now, without alcohol being important. You played music, games and pranks for fun [describes].



piano by mother but didn't appreciate at the time. Joined father in
ung people used to go to Civic or Mainstreet milk bars, and play

round with friends, especially in the Oraka river swimming holes.
n't get dropped off at friends houses. Were told to be seen and not
not inside. Played rounders and made the rules up as they went
ed together. Adults often treated teenagers as children.

join t



Figure 1: Example source data from the oral history collection for Ivan Brown.

In today's terms, the disk storage requirements are modest for the 48 interviews (65 hours of recordings) comprising the Youth Culture collection: the collection requires 424 Mbytes of on-line data (text, images and audio), structured as 1659 integrated and cross-referenced files. As discussed below, the creation and linking of these files is a less daunting task than it appears at first glance, since that process can be largely automated. The complete Hamilton Oral History collection currently contains over 300 interviews and is still growing. The full set of interviews is estimated to require 2.5 Gbytes of storage—which would fit comfortably on a standard PC hard drive.

Indexing is achieved entirely through text files, even though the source data is multimedia. For text collections, much is known about indexing and searching,⁶ but more importantly, free software tools are readily available. Unfortunately, the same is not true for audio and images. While recently significant advances have been made in direct searching of sound, still image, and video files,^{7,8,9} software implementing these research results are still very much in the development stage. Consequently, the decision was made to use text as a conduit to the other media so the project could progress. Two strategies were adopted: linking the media through HTML so a text passage connects to the relevant multimedia document; and developing a text database that “captures” the information imparted through that media.

Below we describe in more detail how each media type is accessed.

Text summaries

The original format of the text summaries, Microsoft Word, was not ideal for Web presentation. Consequently the 48 documents were re-saved by hand as HTML (for a larger collection it is recommended that this process be automated through scripting).

The HTML conversion process was not perfect, resulting in line spacing and layout issues that needed to be resolved and punctuation symbols that had been mapped to non-standard HTML codes. Corrections were necessary to ensure that the layout was readable and attractive when viewed using a variety of Web browsers (and not just Microsoft's Internet Explorer!). Fortunately this task was amenable to automatic text reformatting using the programming language Perl,^{β,10} and required less than 250 lines of code.

The opportunity was also taken to identify section headings, using a set of heuristics: headings were in bold or italics, started a new line and had blank lines above and below. "Speaker icons" were also added, that link section headings to sequentially numbered RealAudio files. The extracted section title information was then used to augment each interview's page with a table of contents, structured so that clicking on an item in the table takes the user directly to the corresponding section. Links to any other relevant documents (such as preliminary notes or photos for that interview) are also created at this point. Finally, a row of speaker icons allows the entire interview to be played sequentially. In total, the software to automate these additions to the interview summary page required 535 lines of code.^χ All of these features are illustrated in Figure 2, the Perl processed version of the HTML document for Ivan Brown.

INTERVIEW WITH : Ivan Brown

DATE : 19 June 1995

INTERVIEWER : Megan Peinell

ABSTRACT BY : Megan Peinell

Contents:

[Background](#)

[Socialising](#)

[Playing with friends](#)

[Going to work](#)

[Community](#)

[Dances](#)

[Photography and Film](#)

[Bodgies and Widgies / Milkbar Cowboys](#)

[Smoking and Drinking](#)

[Religion](#)

[Effects of War on life](#)

[Music](#)

[Pocket Money](#)

[Leaving School](#)

[Picture Theatre](#)

[End of War](#)

[Fashions](#)

[Wedding in 1945](#)

[Local Maori](#)

[War](#)

See Also:

- [Photos supplied by Ivan Brown](#)

Click on a speaker icon to hear the interview.

Tape 1 Side 1



Tape 1 Side 2




Tape 2 Side 1



Tape 2 Side 2



 **Background**

Born Putaruru, 19 May 1930. Father came to Putaruru from Hamilton for work in timber mills, especially TTT (Taupo Totara Timber Company) which had acquired native bush south of Tokoroa and was growing at a remarkable rate. TTT put a private railway line in to Mokai. Father worked as a machinist in mills, and the family lived in one of the 8

Figure 2: The Perl processed version of the HTML document for Ivan Brown.

The text summaries are then indexed by MG,¹¹ a publicly available text retrieval system. Typically MG compresses text to 25% of its original size, and the compressed index occupies around 7% of the size of the original text. This leads to a total storage requirement for the indexed collection of approximately one-third the size of the original text alone. Web access to the data compressed and indexed using MG is provided by the

Greenstone search interface, developed in-house by the New Zealand Digital Library research group. The Greenstone collection building and search interface software is also freely distributed to interested parties.^{8,12}

Photos

The Hamilton Public Library supplied laser copies of a representative cross-section of photos from the interviews (66 in all), which were scanned at 72 dpi (dots per inch) and saved in GIF format. Thumb-nail versions of these images were also generated using PhotoShop, for inclusion in the search results page (see Figure 5). Thumb-nail images allow searchers to quickly scan sets of images, and require far less time to download than full images.

In the absence of freely available software capable of directly indexing the content of images, the decision was made to type in text descriptions of the photos. Using MG in conjunction with HTML it was possible to arrange for a query term matching a photo description to return the photo itself as a search result, and not the indexed text alone. The descriptions are brief—totaling approximately 3000 words—and include any captions listed with the original photos. The descriptive text lists significant objects and provides names for people and places depicted, as well as subjective commentary on the content of the photo. Figure 3 lists the text description entered for the photo shown in Figure 1.

Gentleman (presumably Ivan Brown) showing a 1951 AGFA 16mm projector. Smartly dressed in white striped shirt and tie.

Figure 3: The text description for the photo shown in Figure 1.

Audio tapes

For many computer users, digitized audio is synonymous with gargantuan files. When converting an analogue signal (a taped interview in our case) into a digital stream of numbers the signal must be sampled at regular intervals, and for each sample point the closest discrete (digital) value determined. The approach taken by many file formats, such as *Wav*, is to store this stream of raw numbers to disk. The simplicity of the format means that the conversion process can easily occur at the same speed that a tape plays. The drawback is that this simple technique generates prohibitively large files.

In digitizing, two important parameters are the sample rate and the range of discrete values. To choose a popular combination: sampling at 11.025 kHz using 8-bit samples (giving 256 discrete values), digitizing a 30 minute interview requires 19.8 Mbytes of disk storage. With patience and diligence, however, it is possible to develop a file format using compression techniques that significantly reduces the files size yet decompresses in real time. Once such format is RealNetworks' RealAudio format. Encoding the same 30 minute interview using the RealAudio format for streaming over a 28.8 Kbytes per second modem link requires only 3.43 Mbytes—a reduction factor of 83%.

Unfortunately, the RealAudio compression process is lossy—that is to say, the reconstructed audio played back is not an identical digital version of the one sampled at record time. The higher the compression rate, the more the sound quality deteriorates. Our tests found that the 22.8 Kbytes per second encoding parameter resulted in acceptable sound quality and disk usage. At present, a standard PC based computer configuration includes a 4 Gbyte hard-drive. Allowing 300 Mbytes of the hard-drive reserved for system software, this standard PC could hold over 530 hours of interviews.

Cross-referencing text summaries and digitized audio

With the text summaries and audio on-line, the next step was to cross-reference the text to the audio. Given a sufficiently detailed text transcript of an audio recording, it should be possible to automatically align the digitized recording to the transcript. For instance, an Internet-accessible audio collection of the US Congressional Record matches speaker transitions on recordings of debates in the US House of Representatives to the appropriate transitions in the printed record of those proceedings.¹³ Matching text to audio, however, is still a research topic. Furthermore, like many oral history collections, the Hamilton Youth Collection is not fully transcribed, but only briefly summarized. This makes the problem even harder, and in the absence of readily available software to meet this challenge a different solution had to be found.

An alternative approach is to ignore the text summary provided and extract words directly from the recording using speech recognition software or keyword spotting techniques. While this strategy has worked well for many projects,^{14,15,16,17,18} unfortunately, the current situation is not well suited to our task. Again there is no readily accessible software, and even if there was it is doubtful it would cope with quality of the audio. The recording were made “in the field,” so the software would have to contend with birds chirping and planes flying overhead in addition to the New Zealand accents and, at times, unclear intonation.

Given this analysis of options, the decision was made to cross-reference the data by hand. Using the RealAudio player, each digitized recording was manually scanned to find places corresponding to the section headings in the text, and the time index (how far into the recording this part of the interview was) read off the application’s status bar. This

information was then encoded into the relevant “speaker icon” in the HTML version of the text summary.

Searching the collection

Once all the source data is digitized and indexed, our Greenstone digital library software was used to build the collection and run a server that processes search requests.

Figure 4 shows the advanced query Web-page for the oral history collection. The Greenstone software provides a comprehensive set of full-text search options: case sensitive/insensitive match, stemmed/exact match, ranked/Boolean search, and document/section scope restriction. A simple query page also exists that provides only the text box for “search terms,” setting all other options to sensible default values.

The query results page

VE Day Boolean query, upper/lower case must match, whole word must match. Terms must appear within the same section.

QUERY RESULTS Search Again Review Search Options

Word count: VE: 5; Day: 15
Results for the query **VE Day** (4 documents matched the query).

 **Document title : Ivan Brown, "I thought I'd learnt everything at 15 ; "a teenager during the 1940s**
Section : Effects of War on life
Effects of War on life Vaguely remembers Putaruru becoming a borough with 1,000 people in 1944. Biggest event was VE Day, when everyone went out in streets and yahooped. Recollects being chastised for taking blackout paper off windows during war. Social life restricted because of petrol rationing. Rationing affected the cost of things. Mother stayed home, and made clothes. School trousers made by mother were lined with flour bags.

 **Document title : Photos Supplied by Bill Pope**
Caption : Garden place, VE Day celebrations.
Crowd scene from a parade outside (Victory in Europe celebrations); central to photo 4 men comically dressed (one wearing a dress, top hat with straw poking out and working-men's shoes, another wearing a robe, floppy hat and fake moustache, another with a fake beard -- the fourth man is out of shot) standing around a car; the car is decked out with oars, a small Union Jack, and small skull fixed to the front, and much writing on the bodywork and windows (pilot, co-pilot, this way out); car registration: 142 820. There are crowds to the left and buildings in the background. Decade: 1940s Year: 1945 (258 KBytes) Garden place, VE Day celebrations.

 **Document title : Photos Supplied by Bill Pope**
Caption : Vitoria Street, VE Day celebrations.
Crowd scene outside; central to photo are 5 men (3 of whom are dressed in drag); One man carries a walking stick, another a bottle; other people milling around in background; buildings also appear in background. Of the 3 dressed in drag: one wears a hat, jacket, scarf and knee length skirt, another a hooded jacket with the hood wore up, necklace and short skirt, and the last wearing a cossack styled hat and a jump suit that is too small in length. Decade: 1940s Year: 1945 (82 KBytes) Vitoria Street, VE Day celebrations. See Also An interview by Bill Pope

 **Document title : Photos Supplied by Muriel Bertram**
Caption : VE Day, 1945. Aged 21, holding daughter Lynette.
Muriel dressed for hockey, smiling. Played for Warotiu. Wearing below the knee hemmed skirt, short sleeved polo shirt. Standing in front of trees in a garden. (38 KBytes) VE Day, 1945. Aged 21, holding daughter Lynette.

Figure 5: Result of the query "VE Day."

Figure 5 shows the result of the query "VE Day" using a case-sensitive Boolean search over transcripts and photos. Like many other Web-based search engines (such as AltaVista), the total number of matching documents is broken down into pages and only the first page is initially displayed. In this case only four documents match, but if the number were to exceed ten, then links to the next page of matches appear.

From a results page, individual documents can be accessed by clicking on the hyper-linked icons on the left-hand side. The first icon—a black and white drawing of a young couple dancing—is derived from artwork commissioned for the original library collection and is used to link a results page to a text document. Notice the thumb-nail pictures for photos that match a query. Such pictures serve two purposes: the image takes less time to load than a full-size versions, and it often provides enough detail for the user to decide whether the photo is of interest to them (and consequently whether to load the full size image). Figure 6 shows the result of selecting the first document returned by the search.



Effects of War on life

Vaguely remembers Putaruru becoming a borough with 1,000 people in 1944. Biggest event was VE Day, when everyone went out in streets and "yahooed". Recollects being chastised for taking blackout paper off windows during war.

Social life restricted because of petrol rationing. Rationing affected the cost of things. Mother stayed home, and made clothes. School trousers made by mother were lined with flour bags.



Socialising

"Looking back now they probably sacrificed quite a great deal for the slight enjoyment that we had as children which was going to the matinee at the pictures and looking forward to that each week on a Saturday afternoon, not so much for whatever the picture was, but for the serial of Flash Gordon"

Didn't realise until later but father only had 3 days work per week before the war. Didn't seem to miss out on anything.

What they called a party night then was quite different from now, without alcohol being important. You played music, games and pranks for fun [describes].



Music

Family was musical. Was taught piano by mother but didn't appreciate at the time. Joined father in brass band at 13 or 14. Most young people used to go to Civic or Mainstreet milk bars, and play music on the jukebox.



Playing with friends

Plenty of space on farm to run around with friends, especially in the Oraka river swimming holes. Lack of transport meant you didn't get dropped off at friends houses. Were told to be seen and not heard, to make a racket outside, not inside. Played rounders and made the rules up as they went along. Boys and girls played together. Adults often treated teenagers as children.

Figure 6: The first document returned by the query "VE Day."

Because the search was conducted at the section level, the document is opened at the relevant section. Clicking on a speaker icon launches the RealAudio player, starting at the corresponding point in the audio interview. The player allows the listener to stop and restart the audio at will, provides volume control, and permits the listener to start the audio at any point in the file. Alternatively the user can browse the document, locating links of interest such as photos supplied by the interviewee and any preliminary notes taken during the interview process.

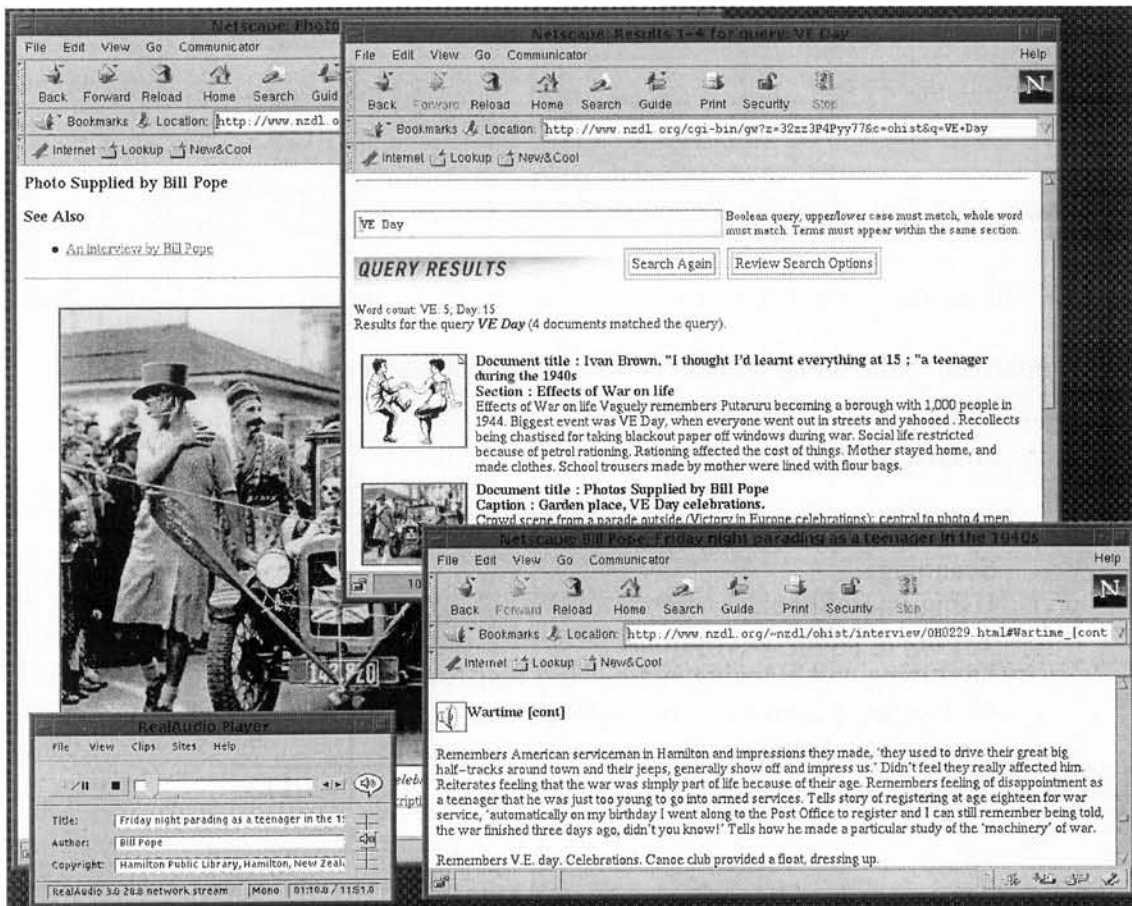


Figure 7: A more complex interaction with the Oral History collection.

Figure 7 captures a longer interactive session. In this case the user has selected the second document returned by the query “VE Day,” and followed HTML links to locate a section of interview transcript connected with the photo. The user has then clicked on the speaker icon to invoke the RealAudio player (lower left of Figure 7) to listen to that part of the interview.

Summary and Conclusions

Figure 8 summarizes the main steps and time taken to develop the Web-based oral history interface to the initial 48 interviews in the Hamilton Youth Culture Collection.

| Activity | Time taken (hours) |
|---|-------------------------------|
| Writing Utility software: | 14 |
| Scanning: | 1 |
| Using PhotoShop: | 1 |
| Typing in photo descriptions: | 5 |
| Digitizing and indexing audio using RealAudio: | 144 |
| Converting Microsoft Word to HTML: | 1 |
| Configuring Greenstone software for collection: | 7 |
| Total | 173 |

Figure 8: Time taken to develop an on-line oral history collection for 48 interviews.

While Microsoft Word and PhotoShop are commercial products, freeware/shareware products exist that can be used in their place (for example, BBEdit and UltimatePaint). Commercial software was used because they were already installed and consequently convenient to access. Although RealAudio is a commercial product, the RealNetworks company freely distributes software to create and play RealAudio files. Using this configuration alone, however, an end-user must wait for the entire file to download before the audio can be played. If the oral history provider purchases an additional piece of software (the RealAudio Server) then the data can be “streamed” over the Web enabling the free RealAudio player to start the playback immediately. The result is a dynamic and more friendly environment for the end-user.

In total it took 173 hours to develop an on-line version of the oral history collection. At 144 hours, the task of digitizing and indexing the audio data clearly dominates this time.

Of course this figure includes the “start-up” cost. The critical path to the process is the digitization step: while the next tape of the collection is being digitized, there is sufficient time to index and cross-reference the previous digitized recording with its corresponding text summary. If the digitizing task were to be repeated, we anticipate that the time taken would be closer to the total length of the recordings.

Figure 9 shows a revised set of figures that factor out the start-up overheads. Working a 35 hour week, if the task were to be repeated it should only take slightly over two weeks to complete. Based on these figures, it is possible to add a new interview to the collection every 92 minutes.

| Activity | Time taken for 48 interviews (hours) | Time taken for 1 interviews (minutes) |
|--|---|--|
| Scanning: | 1 | 1.25 |
| Using PhotoShop: | 1 | 1.25 |
| Typing in photo descriptions: | 5 | 6.25 |
| Digitizing and indexing audio using RealAudio: | 65 | 81.25 |
| Converting Microsoft Word to HTML: | 1 | 1.25 |
| Total | 73 | 91.25 |

Figure 9: Estimated time for adding new interviews to collection.

Further automation of the task will reduce this time. In the future it should be possible to automatically generate a text transcript from the audio recording using readily available, robust speech recognition tools. This not only removes the need for the interviewer to type the text transcript, but also provides access to timing information—permitting the automatic cross-referencing and indexing of transcript with audio.

Such an innovation would greatly lower the human effort involved. However, it does not actually lower the time spent digitizing tapes, since this process is bound by the time it

takes to play the tape. This situation can be improved by using a tape with “high speed dubbing” (and boosting the sample rate appropriately), and/or using more than one tape deck (with recordings set off at staggered starting times).

Taking things one step further, an even better solution is for the interview to be digitized live: that is to say, at the time the interview is carried out. In this scenario, the interviewer uses a laptop computer to digitize the meeting, augmented with a record of time-stamps generated by the interviewer pressing the keyboard or a mouse button when a new topic of discussion is started.

In conclusion, the work described here demonstrates that it is feasible to develop readily accessible oral history collections using current computer software, and that future software developments can be targeted to reduce the labor intensive building task. Our experience is that an on-line version greatly enhances its physical counterpart—it makes it easier to locate information, consequently bringing the collection “to life.”

The oral history collection can be accessed through <http://www.nzdl.org/ohist>.⁶

Endnotes

^a Recent developments with GIF means that in the future it may be necessary to obtain a license before distributing software that uses GIF images. If so, we recommend using an alternative such as PNG, which is equally supported by modern Web browsers but is an open format.

^b Perl stands for Processing Extraction and Report Language.

^z The Perl code used to automate the construction of HTML interview records is available at <http://www.nzdl.org/ohist/perlcode/>.

⁸ Available at <http://www.nzdl.org>.

^e Due to restrictions requested by Hamilton Public Library, the digitized audio is only streamed to their central and branch libraries. All other data (transcripts, and photos) is freely available.

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