

# Get a Way Back: Evaluating Retrieval from History Lists

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## Abstract

Many user interfaces include history lists that help users retrieve temporally ordered information such as previously visited web pages, email messages, and recently used files. Two main types of history lists are widely used. The first type, typified by Netscape Navigator's history list, provides a linear temporally ordered list. The second type, typified by Microsoft Internet Explorer's history list, provides a hierarchical structure based on temporal chunks such as "Today" and "Last Week" at the top level, alphabetically ordered websites at the second level, and alphabetically ordered pages at the lowest level. Despite the wide use of these different types of list, we are unaware of research into their relative merits. This paper describes an experiment that investigates the efficiency of retrieval from four different types of history lists, derived from the two main alternatives described above. The results indicate that simple linear ordering of information is superior to more sophisticated structures.

*Keywords:* Temporal aspects of usability, history lists, document retrieval, browsing history.

## 1 Introduction

History lists are common components in user interfaces. They aim to allow users to easily return to previously used documents and information. Two facts provide strong motivation for the presence of history lists in interfaces. First, human activities with computers are highly repetitive (Greenberg & Witten 1993, Catledge & Pitkow 1995, Tauscher & Greenberg 1997a). Second, models of human memory include 'episodic memory' that stores information about the series of events in our lives (Tulving 1972, Tulving 1983), so retrieval should be aided if interfaces display items in similar episodes, rather than removing them from their context.

Many researchers are exploring how interfaces can better exploit the innate human capabilities for temporal cognition. Research objectives range from trying to understand the efficacy of human memory for computing events (Czerwinski & Horvitz 2002), through the development of automatically generated diaries to act as memory prostheses (Lamming, Brown, Carter, Eldridge, Flynn, Louie, Robinson

& Sellen 1994), to the development of entire file-management systems based on temporal activity rather than on explicitly named hierarchical file spaces (Freeman 1997).

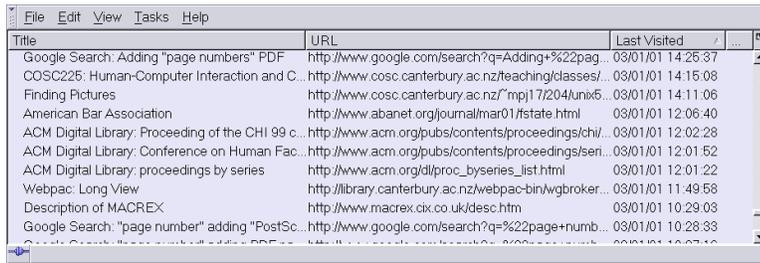
The evaluation described in this paper is less ambitious. It examines the effectiveness of the history list mechanisms currently used in everyday user interfaces. Examples of such history lists include email in-boxes, "recent file" lists, and browsing histories found in Web browsers. There are two common types of history list: simple linear lists, as typified by Netscape Navigator 4 (Figure 1(a)) and categorised trees, as provided by Microsoft Internet Explorer 5 (Figure 1(b)). Categorised-tree interfaces separate the history into a hierarchy. In Internet Explorer, this hierarchy consists of temporal chunks (such as days or weeks) at the top level, alphabetically ordered websites at the second level, and alphabetically ordered pages at the third level.

There has been some research into retrieval from history lists, but the authors know of no empirical studies into the speed of retrieval from different types of list. Tauscher and Greenberg investigated the theoretical performance of different orderings of linear history lists used in Web browsers, concluding that "most recently visited with duplicates removed" allowed for the fastest retrieval (Tauscher & Greenberg 1997b). Hull and Heart found that users often *preferred* retrieving documents from history lists rather than using a file system when using the Web-based interface to the IM<sup>3</sup> system (Hull & Hart 2001), which was used to retrieve printed, photocopied and scanned documents.

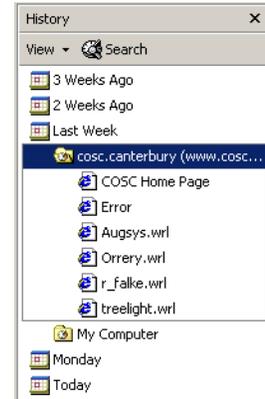
## 2 Method

The experiment compares how quickly users can retrieve web pages from four history list interfaces. The aim is to provide preliminary insights into the relative performance of the different interface types as the users' memory for the information sought varies. All tasks involved retrieving Web-pages from the lists. The target Web-pages were identified with varying amounts of clarity regarding both the time the page was visited and the title of the page.

The evaluation does not investigate *actual* recall. The histories portrayed in the evaluation interfaces were fictitious, and factors associated with degradation of memory were simulated by varying the cuing condition used to prompt the participants' search in the interface. There are many experimental concerns with our 'simulation' of atrophied memory, as discussed in Section 2.4. Despite these concerns, the experiment minimally provides insights into the comparative motor manipulations necessary with the four interfaces.



(a) The history-window of Netscape Navigator 4, with the user's browsing history shown as linear list.



(b) The history-pane of Microsoft Internet Explorer 5, with the history broken down by day and site.

Figure 1: The history lists of Netscape Navigator 4 and Microsoft Internet Explorer 5.

		Time	
		Vague	Precise
Interface	Linear	Vague Title S1-18 S1-18 Precise Title	Vague Title S1-18 S1-18 Precise Title
	Chunking	Vague Title S1-18 S1-18 Precise Title	Vague Title S1-18 S1-18 Precise Title
	TwoPane	Vague Title S1-18 S1-18 Precise Title	Vague Title S1-18 S1-18 Precise Title
	Tree	Vague Title S1-18 S1-18 Precise Title	Vague Title S1-18 S1-18 Precise Title

Figure 2: Design matrix for the experiment.

The experiment was designed as a three-factor repeated analysis of variance for factors *interface-type*, *cuing-time*, and *cuing-title*. Figure 2 summarises the experimental design.

## 2.1 Interfaces

The experiment tested four history list interfaces (Figure 3) that form a continuum from a simple linear list to a complex tree-based history. The interface with the smallest number of controls is the **Linear** list (Figure 3(a)), which was based on the history window of Netscape Navigator. It consists of a simple list and a scroll-bar with the most recently viewed page at the top. The time the page was viewed was listed on the left-hand side of the list, with the title shown in the second column. Retrieval from the Linear interface is expected to be fast when the time the page was viewed is known, as the user can quickly locate the correct time by scrolling.

The most complex interface is the **Tree** (Figure 3(b)), which was based on the history pane of Microsoft Internet Explorer. The top level of the tree hierarchy is the day the page was viewed, the second level is the site the page was from, with the pages alphabetically listed under each site. Each page en-

try consisted of the title, on the left, and the time the page was viewed. To retrieve a page the user has to open each level by clicking on the item in the tree, compared to simply scrolling in the Linear interface. It was expected that retrieval times from the Tree will be slower than for the Linear interface as the site-classification breaks up the temporal ordering, making it harder to find a page using time as a cue. However, retrievals from the Tree were expected to be faster if the user knew the site from which page originated, as the correct site is easier to find using the Tree than the Linear interface.

Two other interfaces were developed, so that individual features in the spectrum between the Linear-List and Tree could be tested. To see if splitting the interface into days affected performance a **Chunking** interface was created (Figure 3(c)). It increased the *perception* of days by highlighting pages that were viewed on the same day. This was done by changing the background colour of the list (alternating between white and tan) in a similar way to the Netscan newsgroup visualisation system (Smith & Fiore 2001). Otherwise, the Chunking interface was the same as the Linear interface. The Chunking interface were expected to be faster than the Linear List because days can more clearly be seen.

The final interface to be developed was the **Two-Pane** list (Figure 3(d)). The browsing history was split into days, with the days listed on the left-hand side of the window. When a day was selected, all pages viewed on that day were listed in the right-hand list with the most recently viewed page at the top. The only major difference between the Two-Pane and Tree interfaces is that the Tree further classifies pages by site, rather than temporal order. Retrievals from the Two-Pane interface were expected to be slower than the Linear and Chunking interfaces when the user knows the time of a page view, as the user has to click on a day and scroll to find a page, rather than simply scrolling.

Each interface held an artificial browsing history consisting of 373 pages split over ten days (two working weeks), which is slightly lower than the average number of page views reported by Cockburn and McKenzie (Cockburn & McKenzie 2001) (41.9 pages per day). Over a thousand pages were randomly selected from 'Global Top 50' websites by Jupiter Me-

Date	Title
Fri Apr 6 12:48:14 2001	AmericanGreetings.com: Concern & Support-Encouragement-Anyone-
Fri Apr 6 12:48:02 2001	http://realguide.real.com/games/?s=game_download&sub=diversions&src=010517realhome_1
Fri Apr 6 12:47:23 2001	Media Buyers
Fri Apr 6 12:46:53 2001	Real.com - Take control of your audio and video playback
Fri Apr 6 12:46:41 2001	Welcome To Focotele, A Leader in Email Marketing
Fri Apr 6 12:46:35 2001	GoTo - List Your Site
Fri Apr 6 12:46:32 2001	http://www.earthlink.com/benefits/survey/feedback.html
Fri Apr 6 12:46:20 2001	IS Redaktion: Neu in T-Online
Fri Apr 6 12:46:12 2001	AmericanGreetings.com: Birthday-Related-
Fri Apr 6 12:46:07 2001	T-Online Service
Fri Apr 6 12:46:04 2001	AmericanGreetings.com: Just Because-Thinking Of You-
Fri Apr 6 12:44:25 2001	FortuneCity > V2Space > Short URL
Fri Apr 6 12:43:59 2001	IWon - Buy or Sell a Car
Fri Apr 6 12:43:43 2001	AmericanGreetings.com: Holidays-Father's Day 6/17/01-Top Picks-
Fri Apr 6 12:41:16 2001	http://www.upcar.com/login/login.asp
Fri Apr 6 12:41:03 2001	AmericanGreetings.com: Teens-Top Picks-
Fri Apr 6 12:40:44 2001	FortuneCity - English - Travel
Fri Apr 6 12:40:38 2001	AmericanGreetings.com - Personalize And Send
Fri Apr 6 12:40:05 2001	FortuneCity - English
Fri Apr 6 12:39:51 2001	SONY Corporation of America
Fri Apr 6 12:39:47 2001	Focotele, Inc.
Fri Apr 6 12:39:40 2001	Real.com: Download RealJukebox or RealJukebox Plus
Fri Apr 6 08:54:09 2001	Corporate Information: X10 Retail Sales Division
Fri Apr 6 08:53:54 2001	eBay Help: Basics - New to ebay?
Fri Apr 6 08:53:16 2001	Homestead - Free Web Sites
Fri Apr 6 08:52:23 2001	Homestead - Free Web Sites
Fri Apr 6 08:52:05 2001	Makeup Maven: Makeup and Cosmetics Advice
Fri Apr 6 08:49:48 2001	iWon - Communicate
Fri Apr 6 08:49:00 2001	MyPoints
Fri Apr 6 08:47:49 2001	Customer support - find the help you need
Fri Apr 6 08:46:24 2001	What the Press Thinks about the XCam2 Video Camera; Press Quotes
Fri Apr 6 08:45:53 2001	AmericanGreetings.com: Love-Marry Me-
Fri Apr 6 08:45:05 2001	Take our Survey

(a) The Linear-List interface sorted the pages with the most recently viewed at the top.

Page	Date
Friday	
Thursday	
Wednesday	
disney.go.com	
www.about.com	
www.americangreetings.com	
www.colonize.com	
www.ebay.com	
www.focotele.com	
www.fortunecity.com	
www.getsmat.com	
www.homestead.com	
www.killgame.com	
www.lowestbid.com	
www.mypoints.com	
www.nifty.com	
www.real.com	
www.sony.com	
www.upcar.com	
www.women.com	
Work channel	
Hair Helper: Haircare and Styling Advice	Wed Apr 4 12:29:50 2001
Women's Auto Center	Wed Apr 4 12:29:32 2001
Monday	
Friday	
Thursday	
Wednesday	
Tuesday	
Monday	

(b) The Tree interface divides the list into days and then each day is divided further into sites.

Date	Title
Fri Apr 6 08:47:35 2001	tools/index: technologies tailored for women
Fri Apr 6 08:41:48 2001	About - Internet & Online
Fri Apr 6 08:39:15 2001	AmericanGreetings.com: Collections-Sports Fun by Gary Patterson-Just Because-
Fri Apr 6 08:39:06 2001	Homestead - Free Web Sites
Fri Apr 6 08:38:41 2001	A Special Kiss
Fri Apr 6 08:38:06 2001	Women.com Channels
Fri Apr 6 08:37:34 2001	Sony Music: Contents
Fri Apr 6 08:36:07 2001	X10's Decorator Dimmer Switch Special Offer!
Fri Apr 6 08:35:55 2001	NightWatch Surveillance Cam monitors your yard under extreme low-light conditions!
Thu Apr 5 12:42:27 2001	My Excite Start Page
Thu Apr 5 12:42:12 2001	IWon - Celebrities
Thu Apr 5 12:41:41 2001	upcar.com - How Low Can You Go?
Thu Apr 5 12:41:31 2001	Snoypoll.com
Thu Apr 5 12:41:06 2001	Fun&Action-Portal - Button-Liste
Thu Apr 5 12:39:53 2001	@illy \$8J81 [1]
Thu Apr 5 12:39:49 2001	iWon - Games
Thu Apr 5 12:39:25 2001	Women.com Help Menu
Thu Apr 5 12:39:23 2001	FortuneCity > Promote Your Site
Thu Apr 5 12:38:59 2001	eBay Site Help
Thu Apr 5 12:38:56 2001	Find the Contractor Near You Today!
Thu Apr 5 12:38:49 2001	iWon - Sign In
Thu Apr 5 12:38:26 2001	www.realtor.ca.com
Thu Apr 5 12:38:12 2001	AmericanGreetings.com: Concern & Support-Top Picks-
Thu Apr 5 12:38:07 2001	RealNetworks.com - Jobs Site
Thu Apr 5 12:38:02 2001	AmericanGreetings.com: To Kids-Top Picks-
Thu Apr 5 12:37:55 2001	AmericanGreetings.com: Just Because-Sorry-
Thu Apr 5 12:37:51 2001	Homestead - Free Web Sites
Thu Apr 5 12:37:35 2001	AmericanGreetings.com: Collections-Movies-Pokemon-
Thu Apr 5 12:37:34 2001	IWon - Transportation
Thu Apr 5 12:36:51 2001	Index
Thu Apr 5 12:36:31 2001	AmericanGreetings.com: Holidays-Mother's Day 5/13/01-Top Picks-
Thu Apr 5 12:36:30 2001	IWon - Business
Thu Apr 5 12:36:25 2001	Welcome to Vacom
Thu Apr 5 12:34:29 2001	...

(c) The Chunking interface was the same as the Linear List except the background colour was changed when the day changed.

Day	Date	Title
Friday	Fri Apr 6 12:48:14 2001	AmericanGreetings.com: Concern & Support-Encouragement-Anyone-
Thursday	Fri Apr 6 12:48:02 2001	http://realguide.real.com/games/?s=game_download&sub=diversions&src=010517realhome_1
Wednesday	Fri Apr 6 12:47:23 2001	Media Buyers
Tuesday	Fri Apr 6 12:46:53 2001	Real.com - Take control of your audio and video playback
Monday	Fri Apr 6 12:46:41 2001	Welcome To Focotele, A Leader in Email Marketing
Friday	Fri Apr 6 12:46:35 2001	GoTo - List Your Site
Thursday	Fri Apr 6 12:46:32 2001	http://www.earthlink.com/benefits/survey/feedback.html
Wednesday	Fri Apr 6 12:46:20 2001	IS Redaktion: Neu in T-Online
Tuesday	Fri Apr 6 12:46:12 2001	AmericanGreetings.com: Birthday-Related-
Monday	Fri Apr 6 12:46:07 2001	T-Online Service
	Fri Apr 6 12:46:04 2001	AmericanGreetings.com: Just Because-Thinking Of You-
	Fri Apr 6 12:44:25 2001	FortuneCity > V2Space > Short URL
	Fri Apr 6 12:43:59 2001	IWon - Buy or Sell a Car
	Fri Apr 6 12:43:43 2001	AmericanGreetings.com: Holidays-Father's Day 6/17/01-Top Picks-
	Fri Apr 6 12:41:16 2001	http://www.upcar.com/login/login.asp
	Fri Apr 6 12:41:03 2001	AmericanGreetings.com: Teens-Top Picks-
	Fri Apr 6 12:40:44 2001	FortuneCity - English - Travel
	Fri Apr 6 12:40:38 2001	AmericanGreetings.com - Personalize And Send
	Fri Apr 6 12:40:05 2001	FortuneCity - English
	Fri Apr 6 12:39:51 2001	SONY Corporation of America
	Fri Apr 6 12:39:47 2001	Focotele, Inc.
	Fri Apr 6 12:39:40 2001	Real.com: Download RealJukebox or RealJukebox Plus
	Fri Apr 6 08:54:09 2001	Corporate Information: X10 Retail Sales Division
	Fri Apr 6 08:53:54 2001	eBay Help: Basics - New to ebay?
	Fri Apr 6 08:53:16 2001	Homestead - Free Web Sites
	Fri Apr 6 08:52:23 2001	Homestead - Free Web Sites
	Fri Apr 6 08:52:05 2001	Makeup Maven: Makeup and Cosmetics Advice
	Fri Apr 6 08:49:48 2001	iWon - Communicate
	Fri Apr 6 08:49:00 2001	MyPoints
	Fri Apr 6 08:47:49 2001	Customer support - find the help you need
	Fri Apr 6 08:46:24 2001	What the Press Thinks about the XCam2 Video Camera; Press Quotes
	Fri Apr 6 08:45:53 2001	AmericanGreetings.com: Love-Marry Me-
	Fri Apr 6 08:45:05 2001	Take our Survey

(d) The Two-Pane interface divides the list into days, shown in the left-hand pane, with all the pages viewed on that day shown on the right.

Figure 3: The interfaces used in the experiment.

dia Metrix (Metrix 2001), and four randomly chosen subsets of these pages were used to populate the interfaces. The problems caused by the use of an artificial browsing history are discussed in Section 2.4.

## 2.2 Cuing

Retrievals were cued with time the page was viewed and the title of the page, as this is the most generic subset of information provided by most history-lists. The time cue could be precise, with the exact time, or vague with a range of three to four days. The title cue could also be precise or vague. A precise title was the same as the title in the history list, and included the site name; a vague title was a keyword taken from the title in the history list, and did not include the site name. Table 1 lists the four possible cuing conditions, with examples.

## 2.3 Participant Details and Treatment

Eighteen third-year Computer Science students participated in the experiment, and were rewarded with a lottery ticket. Microsoft Windows was the ‘normal’ operating system for five participants, Unix was normal for four, while nine said that both Windows and Unix were their normal operating systems. The participants’ normal browsers followed a similar split: Microsoft Internet Explorer was normally used by five participants, Netscape Navigator by another five, and Internet Explorer and Navigator being normally used by the remaining eight. (Unix with Netscape Navigator is the standard computing environment used by third-year Computer Science students at the University of Canterbury.)

The experiment started with the purpose of the test being explained to the participant. Each participant used all the interfaces. The interfaces were presented in a random order to mitigate any learning effects. In addition, the pages listed in each interface were changed to further avoid any learning effects. The page view-times were not changed between interfaces, so, for example, all interfaces had a page viewed at ‘Fri Apr 6 08:49:00 2001’. (No participants realised that the page view-times were the same between interfaces.) When an interface was introduced the participant was shown how to retrieve pages using the interface. A single training task was given: to retrieve the most recently viewed page in the history, which was the top-most item in all the interfaces except the Tree. Each participant was then asked to retrieve eight different pages, two for each of the cuing conditions. Timing of the retrieval task, which was automatically logged, was started when the cue was given and stopped when the user clicked on the correct page.

After retrieving the page the participants were asked if they agreed with the statement “It was easy to find this page”, using a five-point Likert scale, with five as ‘agree’.<sup>1</sup> At the end of the experiment the participant was shown a picture of the interface and asked if he or she agreed to the two statements “This interface was easy to use” and “I could find pages quickly using this interface” as rated on the same Likert scale as before. For the questions, the interfaces were shown in the order Linear-List, Chunking, Two-Pane, and Tree.

<sup>1</sup>This is the same format as course surveys at the University of Canterbury, which most students fill out regularly.

## 2.4 Experimental Concerns

There are a number of problems with the experiment caused by the use of an artificial browsing history, rather than the user’s own data. Firstly the user has no prior knowledge of when a page was viewed — so the cue has to be relied on to provide all the information. We suspect that this would cause retrievals in this experiment to be slower than those from user’s own browsing history, but no bias for any particular interface would be introduced as it affects all interfaces equally.

Secondly there is no context for page items. Normally browsing histories have clusters of related pages, or ‘episodes’ (Abrams, Baecker & Chignell 1998), so the user has to look for a group of pages, which is not possible in this experiment. It is likely that this would lead to slower retrieval times from all interfaces except the Tree, which does not display items in temporal order.

Finally, the user may not be familiar with the sites in the history, so when a vague title cue, such as ‘more music’, is provided the participant does not associate the correct site with the keywords. This may lead to slower retrievals from the Tree interface under the precise title cuing condition, as it relies on the user remembering the site that is associated with a page for quick retrieval.

## 3 Results

All the participants understood and successfully completed the experiment. The mean retrieval time was high at 55.6 seconds with a large degree of variability (standard deviation 53.4). The high variation per interface can be explained by the substantial differences between precise and vague cuing times, as shown in Figure 4(b). This high and variable task time was reflected by substantial frustration from many of the participants.

There was as significant difference between the mean retrieval times for the four interfaces ( $F(3, 42) = 4.8, p < 0.01$ ) with users taking 69.8 seconds (s.d. = 63.4) to retrieve pages using the Tree, compared to 46.5 seconds (s.d. = 44.2) using the Two-Pane interface (Figure 4(a)). Post-hoc analysis shows there is a significant-difference between the retrieval times from the Tree and Two-Pane interfaces, as well as the Tree and Linear-list (Tukey Test, HSD = 17.5). However there was no honest significant-difference between any other pair of means.

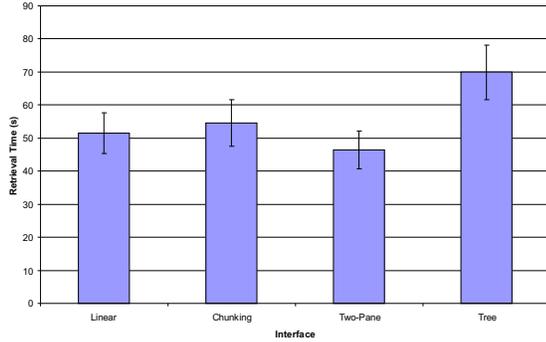
As expected, users were significantly faster when more information was given as a cue ( $F(3, 42) = 11.7, p < 0.01$ ), as can be seen in Figure 4(b). Retrievals with a precise time and title cues took 16.5 seconds (s.d. = 10.4) on average, while vague time and title searches took 114.3 seconds (s.d. = 58.0). Post-hoc analysis shows there is a significant difference between all pairs of means (Tukey Test HSD = 13.0).

Retrievals from the Tree interface was significantly slower than the other three interfaces when precise-time cues were provided. On average, retrievals took 46.1 seconds (s.d. = 40.7) using the Tree interface, compared to 16.2 seconds (s.d. = 6.2) for the Chunking interface, which was faster than the Two-Pane and Linear interfaces, with retrieval times of 17.9 seconds (s.d. = 11.83 and s.d. = 7.6 seconds respectively).

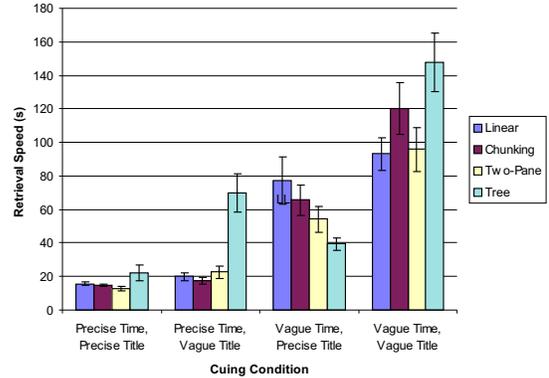
However, the Tree interface was the fastest when the retrieval was cued with a time range and a precise title, with a mean retrieval time of 39.4 seconds (s.d. = 14.7) compared to the next fastest interface,

Cuing Condition	Title	Example Time
Precise Title, Precise Time	Lots of Lemons at Fruit.com	Wed Apr 4 12:34:24 2001
Vague Title, Precise Time	Lemons	Wed Apr 4 12:34:24 2001
Precise Title, Vague Time	Lots of Lemons at Fruit.com	One to three days ago
Vague Title, Vague Time	Lemons	One to three days ago

Table 1: Example cuing conditions.



(a) Mean page retrieval times for each interface.



(b) Mean page retrieval times for each cuing condition.

Figure 4: Mean page retrieval times across interface-type and cuing condition. Error bars indicate +/- one standard error around the mean.

Two-Pane, which had a mean retrieval time of 54.1 (S.D. = 30.72).

Users thought the Two-pane interface was easier and quicker to use than the other three interfaces, as can be seen in Table 2. In addition the Tree interface was given the lowest mean ratings by the users.

#### 4 Discussion

Retrievals from the Tree interface were generally slower than the other three interfaces because users had difficulty finding pages. To find a page using the Tree the user had to open a day, open a site and then scan the pages within the site. If a vague title was given as a cue each user would have to open each site viewed on that day as the site was not given as part of the title. However, when searching for a particular site over a range of days (a precise title, vague time cuing condition) retrievals from the Tree interface were faster than the other three interfaces. This was because a user could open a day, check for the site, and move onto the next day if the page being sought was not there.

The speed of retrievals from the Linear, Chunking, and Two-Pane interfaces were not significantly different in speed, indicating that breaking the history into days does not allow users to retrieve pages faster, but it does not slow the users down. As the only major difference between the Two-Pane and Tree interfaces is the site-classification then it can be concluded that it is the site-classification that is the cause of the slower page retrieval times from the Tree interface.

Why the users preferred the Two-Pane interface is unknown — but they did appear to like splitting the history into days despite the higher complexity of the interface.

#### 5 Conclusion

An experiment was conducted to provide designers with a guide to creating history lists. The experiment was based on the retrieval of Web pages, but the results are applicable to many other history-list retrieval tasks, as the participants only used view-time and page-title as the retrieval cue, and both these cues have similar fields in other history lists, such as the subject of an email, or the creation time of a file.

It is recommended that systems do not split a history using a secondary key, such as a site or author, as the test interface that implemented this feature had the slowest retrieval speeds and was the least preferred of the four test interfaces. Users did prefer the interface that broke the history into days, but were not significantly faster at retrieving pages from that interface.

There may be an advantage to breaking the history list by a secondary key when the key is known to the user and a range of days are being searched. However, this experiment did not produce results that showed a significant difference in retrieval speed under this cuing condition for the interface that implemented this feature.

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Statement	Linear	Chunking	Two-pane	Tree	Friedman Test	Significant
This interface was easy to use.	3.1 (0.8)	3.4 (0.8)	3.8 (1.0)	2.2 (0.9)	$X_r^2 = 18.2$ , $df = 3$	✓
I could find pages quickly using this interface.	3.8 (1.1)	4.0 (0.8)	4.1 (0.8)	2.6 (1.1)	$X_r^2 = 23.2$ , $df = 3$	✓
It was easy to find this page.	3.4 (1.4)	3.4 (1.3)	3.6 (1.2)	2.9 (1.4)	$X_r^2 = 22.6$ , $df = 3$	✓

Table 2: User evaluations of the interfaces, as measured on a five point Likert scale (five is agree).

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