

Going Back in Hypertext

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ABSTRACT

Hypertext interfaces typically involve navigation, the act (and interaction) of moving from one piece of information to another. Navigation can be exploratory, or it may involve backtracking to some previously-visited node. While backtracking interfaces are common, they may not reflect differences in readers' purposes and mental models. This paper draws on some empirical evidence regarding navigation between and within documents to suggest improvements on traditional hypertext navigation, and proposes a time-based view of backtracking.

Categories and subject descriptors

H.5.4 [Hypertext/Hypermedia]: *Navigation*

General terms

Design, Experimentation, Human Factors

1. INTRODUCTION

The term "Navigation" has become virtually synonymous with any kind of interaction with documents, and this conflation of different interfaces and behaviors hides important differences. For example, some navigation, such as page turning, supports reading. Other navigation, such as following a link from an index to a help file, supports information seeking.

Such interfaces are designed to facilitate the retrieval or discovery of information. Often, however, people navigate not with the intent of reaching a potentially useful node, but rather with the intent of leaving a not (or no longer) useful one because they accidentally selected a wrong link, because it wasn't clear from the anchor what the destination would be, or because they extracted the useful information from the node and wish to return to some previous location or path. Furthermore, the user may desire to revisit a place seen "long ago" rather than just recently.

These are qualitatively different kinds of navigation that require different interfaces. Web browsers provide a "back" button that steps through the interaction history, serving both the short- and long-term back-tracking purposes. Such implementations have some usability problems due to the way long-term history is handled. As described in [[1]], browsers prune previous branches when a new anchor is selected following a backtracking episode. This pruning often causes confusion and frustration as recently-visited pages may no longer be easily accessible.

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We used XLibris [2], a reading appliance, to explore the design of navigation and backtracking interfaces. In the remainder of this paper, describes the evolution of navigation interfaces in XLibris.

2. NAVIGATION IN XLIBRIS

XLibris 1.0 is a hypertext interface for reading, annotating, and navigating among documents. Readers move between pages of a document, switch among documents, and follow links between passages of different documents. XLibris 1.0 distinguishes between views and pages: a view showed a particular kind of information (e.g., a document page, a list of annotations, etc.), and each view consists of one or more pages. Each view also carries its own, specialized, controls. Views are equivalent to windows in a typical PC application, and pages are their contents.

The history mechanism in XLibris 1.0 is designed to compensate for some shortcomings of traditional web browser interfaces. The system keeps track of locations visited by the user, and provides "previous view" and "next view" controls for backtracking, as shown in Figure 1. This mechanism makes it possible to follow a link, to jump back to a previous location, follow another, and then to backtrack through all the visited views.



Figure 1. Controls in XLibris 1.0. The navigation buttons are just right of center.

Say the user visits three documents (A, B, and C) then backtracks from C and visits document D. Backtracking from this point in a typical Web browser would yield the sequence B,A; in the modified XLibris interface, the sequence would be B,C,B,A.

3. EVALUATION AND REDESIGN

We evaluated XLibris 1.0 in a study of a reading group [[2]] to discover strengths, deficiencies and usability problems. Although readers were positive overall, they found the navigation interface confusing. For example, it was not always clear where "previous view" or "next view" buttons would lead, and some participants stopped using those controls, relying instead on forward paths (often significantly more involved) through the documents.

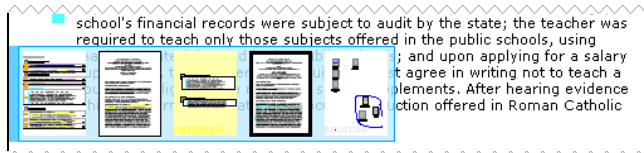


Figure 2. History overlay in XLibris 2.0. A tap on an icon takes the reader to the corresponding view.

3.1. Redesign

We redesigned the navigation interface for XLibris 2.0 by replacing the previous and next buttons with a menu of the five most recently-visited views, as shown in Figure 2. Each thumbnail reflects the current state of the document; tapping selects the

corresponding view. Views are "recycled" in this history: if the reader moves to a view that is already in the history, the existing item is emphasized with a dark border (as shown in Figure 2), but no new item is added. This history is not strictly chronological; rather it is a visual memory of recently-viewed information.

Although the new interface solved some of the usability problems with the original design, preliminary use of XLibris 2.0 suggested that it may be difficult to undo certain kinds of navigation. For example, assume a user follows a link from an annotation view to the annotated page, and then wishes to return to that view. How will this happen? One possibility is to open the history overlay, to find the annotations view in it (it should be the one with the thin black border, being the previous view), and to select it. Another possibility is to select the "annotations" view directly. Both interactions involve two taps and potentially a significant amount of thought and visual search to find the right button. This suggests that too much cognitive effort is required for a simple operation.

3.2. Back button

We introduced the "back" button to reduce the cognitive effort associated with backtracking. When a reader jumps to a document from another location (e.g., another document, the annotations view, etc.), the system adds a button near the destination passage (Figure 3). This button identifies the target visually, and it provides an obvious way for "undoing" the navigation.

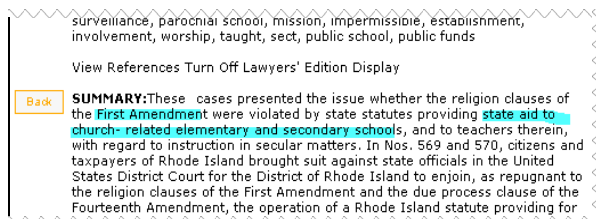


Figure 3. A document page fragment with the back button.

The button is placed near the target of the forward link to underscore its temporary nature, and persists only while the reader remains in the target view. If the reader jumps to a recent view (via the history overlay) or to another view via a view selection button, the back button disappears, since it probably won't be meaningful to the reader when that view is revisited in the future.

There is a small contradiction in the rules suggested by the previous paragraphs which occurs if the reader follows more than one embedded link in a row. Say the reader jumps from an annotation view to a page, and then follows an embedded link to a page in another document. Clearly a back button is desirable for the embedded link. Retaining the button for the first page (where "back" refers to the annotation view), violates the criterion that switching to a different view should cancel the button. Yet an argument could be made for retaining it. Empirical evidence will be required to determine the more usable alternative.

3.3. Intra-document navigation

Our recent deployment of XLibris uncovered another navigation-related problem. When reading a lengthy document, people often wish to refer to other parts of the document (e.g., a references section), and then resume reading where they left off. On paper this is as easy as sticking a thumb between to sheets of paper; on

the computer this typically involves significant interaction, such as making and selecting bookmarks. It is possible, however, to streamline this intra-document navigation without introducing additional controls. We can extend the history overlay (Figure 2) to retain separate thumbnails of pages within the same document: not all pages, but rather pages accessed in a non-sequential manner.

Such jumps may occur as results of a hypertext link, or as episodes of rapid page flipping. Interviews with users and analyses of XLibris activity logs suggest that there are two kinds of page flipping: slow, for the purposes of reading, and fast, for the purposes of getting to a different part of a document. We can detect these rapid page-flipping sequences, and use them to identify endpoints of a logical link. Once link endpoints are identified (explicitly or implicitly), separate thumbnails can be used to represent them in the history view. This reduces within-document navigation to a single tap.

4. CONCLUSIONS

Our experience suggests a model for backtracking based on the temporal nature of the activity: The navigational "undo": (illustrated by our back button) is temporally the most immediate and ephemeral. These qualities should be reflected in the interface (by appearance and position, for example) to facilitate navigation. Such controls may be useful not only in conventional hypertexts, but also in any situation when users move through documents, such as in a word processing program.

The next level in backtracking may be thought of as a short-term history in which the reader's ability to recognize the desired target quickly is more important than strict temporal accuracy. These kinds of interfaces can allow users to manage a small working set of documents through a single window without regard for sequence of access.

Finally, there is the long-term history of interaction, not addressed in our design. As time passes and events accumulate, users are less likely to remember the exact sequence of events, and may rely more on searching or on overviews or hub nodes to find the desired information.

5. ACKNOWLEDGMENTS

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