

Layered hypertexts

Adding a new narrative dimension to the web

Introduction

This paper describes early experiences and implications of web hypertexts, which are literarily layered on top of existing web contents. Whereas traditional hypertexts cite and refer to other texts, in layered hypertexts, the texts that are talked about are visible at the same time as the added narrative layer. This allows the author not just to cite and describe contents, but to but also to refer to and comment on contents that the reader also can see at the same time. Moreover, it allows the author to create paths through hypertexts on other sites. Here, I describe layered guided tours, blogs, and discussions and discuss issues for such systems. I describe these as layered annotated paths.

An early layered hypertext system was the “third voice” system, which was rather quickly discontinued. It allowed visitors to discuss pages, directly on any page that they visited, through the “third voice” system. This therefore removed the discussion beyond the control of whoever owned the content being discussed. A current system, which is similar, is the Diigo.com service, which allows people to make public or private notes directly on web pages they visit – and which are visible to themselves later, or to other visitors. (Zellweger, Bouvin, Jehøj, & Mackinlay (2001) describe such a system, and also discuss similar systems. A problem described is that annotations become “orphaned” if the annotation anchor is removed. This can for instance happen if you place your annotation anchor on an online newspaper headline – later, that headline will be replaced with something else and the anchor lost. The basic idea of annotating hypertexts is not new, but were part of the vision of the Memex dating back to 1945 (Bush, 1979).

Like Marshall (1998) describes, annotations can be public or private, permanent or transient. They can also be formal (such as categories), or be implicit (such as highlighting contents – if the reason for highlighting is implicit), or explicit contents that other people can more easily understand. As shown in the WEBTOUR system, there are also many kinds of annotations (Sastry, Lewis, & Pizano, 1999). Sastry et.al. describes multimedia annotations (such as mouse movements, or audio comments), and interactions such as link traversals.

In the Memex, contents would have locations, much like on the web today. But the Memex also had the notion of a trail, created by the user, by linking pages to each other by association. Memex tagging would be done by linking pages placed next to each other, by associating them with each other through an unique code. When a user would visit a page with an association, the association would also be shown, allowing the user to take part of the associated materials. A series of such associations would form a trail. Trails, or paths as they are also called, are covered extensively in the literature. For instance, Sandvad, Grønæk, Sloth, & Lindskov Knudsen (2001) describe a system for creating and viewing paths through hypertexts by inserting a navigation aid on the pages, and relates that system to other systems. The Memex kind of tour of associated pages can thus be entered at any location in the path. However, there are also guided tours with entrance and exit, which have different entrance and exit nodes.

Thus, as soon as pages are linked, a sequential trail is formed. In addition to sequential paths, there are branching paths, where the user has to decide where to go next. If the computer makes that decision, it is instead a conditional path. Zellweger (1989) describes several kinds of conditional paths. Trails are similar to indexes, as Isakowitz, Stohr, & Balasubramanian (1995) defines the two

“An index acts as a table of contents to a list of entity instances, providing direct access to each listed item. A guided tour implements a linear path through a collection of items, allowing the user to move either forward or backward on the path.”

(P 36, emphasis in original).

Isakowitz et.al. describes conditional tours (back / forward) and conditional indexed guided tours (back/forward with an index). But there are more to paths than just sequence, start, branches, and exits. Bernstein (1998) describes many additional aspects, as patterns.

The case: annotated layered paths

For this paper, an annotation script was used, and then three different genres of web contents were created – a guided tour, a blog entry, and a discussion forum.

Annotation

For annotation, a user script was used. That is simply a piece of JavaScript loaded into the browser by a browser plug-in, and then injected into pages that the user visits, and executed together with other scripts on the page. That is currently the easiest way of adding functionality to a web browser. Other ways of doing that are bookmarklets and browser plugins, and these work in similar ways. A bookmarklet must be activated once for each page an user visits, and a user script can be converted into a browser plugin if it is to be used on a more permanent basis.

When executed, the script presented a semi-transparent moveable annotation area layered on top of existing contents on the web page (Figure 1). Thus, the author could see the contents on the page through the area, and move the area when needed. When the author submitted the annotation, it was sent to a web server running a content management system, which processed the annotation and sent back the resulting text to the annotation area. The annotation was in this case anchored to the web page url, and not anchored to any specific position or content element on the page.

The annotation featured a heading and a text area for explicit and implicit annotation. The annotation area also had two formal annotation areas for keywords. This can be compared to the Memex (Bush, 1979), where associations between pages would be done by giving two pages a code, which would identify them as associated with each other. Here, instead, the code (tag) is decided by the user. When two pages then share the same tag, then this can be used to associate them with each other. When several pages use the same tag, a path is formed, as a sequence of annotations. Here two different tag areas are used, but any number of formal annotation areas can be used. Thus, the same principle is used here, as described for the Memex. Also, an additional code is used, associating nodes with specific pages. If several annotations would be associated with the same page, then these annotations would share the same page code. In the implementation used here, nodes are numbered, otherwise there would be no path, just a collection of related nodes. In the Memex, numbers would not be needed.

Layered guided tour and the reader interface

The web tour (e.g. Lundberg, 2006a; 2006b) is comparable to a guided tour in a city or a museum, or comparable to the common read-also links found on web pages. Just like the tour guide, the web tour follows the reader around different web sites, presenting comments to them on a tour layer. Unlike the read-also links, which takes you away from the page containing the link, the web tour can also present other read-also links constituting the remaining tour, on the web page you visit.

For a distance course in web publishing, a guided tour was made to introduce the students to important parts of the course web sites (Figure 2). Since the course used several different systems for different parts of its web, this would be a good test case.

The tour used an entry page where the tour could be loaded, and subsequently it could be existed at any node. It could also be minimized into a bar, and moved around on the page. The tour thus was a sequential tour with entrance and exit. The loaded tour was temporarily stored as a kind of “cookie” at the users computer and loaded from there each time the tour script was injected (on every page the user visited). The tour could thus be stored as a static page on the server, and the script only communicated with the server to load the script. Since the tour stayed visible until the user exited the tour, the user could deviate to other sites and pages, and still have the tour available, to return to at any time.

As shown in Figure 2, the tour consisted of one heading with a short text, for each page in the tour. The tour did not use the traditional next-previous buttons common in paths. The tour instead had a “go to current section” button, which smoothly scrolls the page to the tour section corresponding to the current page. This particular tour had 11 entries. Clicking on a heading loaded the corresponding web page. The current section (about the current page) was also highlighted with a yellow arrow, as illustrated in the figure.

The tour commented on and highlighted important introductory pages of the main course site. It also introduced other systems used in the course, and showed key pages there. For instance, the tour showed where to sign up to different systems, and instructed on how to do that. It also highlighted differences between the systems, pointing out where for instance the main navigation elements were located in the different systems.

Layered blog

The blog (Figure 3) used the same interface for reading (and annotating pages). For the blog, one blog entry was given one tour. Thus, on the blog home page one could reach one tour for each entry, although for this paper only one blog entry was made. One blog entry thus consisted of annotations from one or more web pages, sharing a common blog entry id tag. In this particular case, the blog entry commented on what other bloggers had been writing about a recent issue, namely whether the Internet is like a series of tubes, as an US senator had claimed. The blog first introduced the story, with a longer introduction and commentary of the story on the page in the background. It then progressed to a page containing an audio file of that senator’s speech, pointing out where on that page the file could be found. The blog then went on with another commentary on the story on a different page. The blog entry concluded with links to two pages where people could get the idea that the Internet is indeed like a series of tubes, first a school page, and then a museum page.

Layered discussion

The discussion interface was implemented, but no real discussion had taken place at the time of writing, since the system was only online on a small local network for testing purposes. For discussions, the annotation interface was used. It had two sides. On the front page, the discussion was shown. On the back, the annotation interface was shown. When a new annotation was made, it appeared below the previous, like in traditional discussion forums or chat applications. For discussions, the system assigned the code connecting discussion entries with each other, using the current url as the code. Each time the user visited a page, the server was contacted by the script, looking for and loading discussion entries for that page.

Discussion

The principle used in layering, is tight coupling between annotation and original contents by overlaying contents instead of referring to them on a separate page. Thus, the contents are even tighter coupled with the original text than if they are merely referred. That makes fixity even more important to consider. Changes to the page discussed become more evident, which in some case might be good, such as in the blog case – you can see if the writer still has the same point of view. In other cases it might be bad, such as in the instruction tour which is only useful if the pages it describes correspond to the tour, or with spatial changes in the page – it merely confuses if the text refers to something being on the right, if it has moved to the left. On the web, to solve issues such as this, the permalink construct is commonly used to indicate the permanent location of contents, but not the permanence of presentation style. As Zellweger, Bouvin, Jehøj, & Mackinlay (2001) points out, fixity becomes even more critical if contents are to be anchored at specific contents on the page, rather than to the page as a whole, as is done in the current cases. The tour can also be seen as a kind of content re-use (Garzotto, Mainetti, & Paolini, 1996), where the tour adds contents to the existing nodes. Possibly, the tour could also be used to highlight contents, by deleting other contents from the presentation of page, or by re-organizing them. Or, to highlight contents by adding presentation aspects to the original page, as is done in many annotation systems.

As described above, the system implements the same basic principle of creating paths as was

described for the Memex (Bush, 1979). However, allowing the user to tag several pages with one common code, as is done here, has some advantages. Firstly, the Memex-style of tagging makes all associations between pages equal. When you enter a branch, there is no way of seeing which way to go, with Memex associations, since all associations use different codes. With the approach used here, it is possible to see in which direction the current path continues, since all nodes on the same path, share one code (and thus possibly one label identifying the path). The tagging style used here also makes it possible to load a path as a whole, since it has a distinct beginning and end, as is done in the web tour example. In a network, such as the Memex, the system would not contain information about at what node to stop following associations when creating the path, and what branches to include. With Memex tagging, re-ordering (such as inserting a node in a path) would mean splitting joined documents, and then re-associating them. In this system, changing the node numbers instead causes reordering.

There can be many overarching purposes of layered stories. The purpose of the tour used as a case here is firstly to give an overview of the course sites. Secondly, it provides instructions of how to perform important tasks at some pages in the tour, such as creating new users in different course systems. It also describes the different systems, and the page layouts, pointing out where on the page different navigation elements are, for instance. As in

“... On top of the page you see a navigation bar... “ (Figure 1).

“ ... you can do that by clicking on ”log in” in the menu to the left, and then on ”create account. ”

The tour goes on, pointing out where the corresponding elements are in other systems used in the course, and referring to other things on the page. The references could be made more salient with highlighting of the things referred to, which is currently not implemented in this system, but which is used in other systems (e.g. Zellweger et al., 2001).

With such goals, it is important that the tour itself does not cause disorientation, or lack of overview. Therefore, the entire path of the tour is visible at the same time, providing overview. Orienting is supported by a marker, indicating the section relevant for the current page (Figure 1), and also a link which scrolls the page to that section. That, in itself, can cause disorientation, and therefore a smooth scroll is used, showing the user how the page is scrolled. The alternative would have been the default instant movement on the page, which is normally used on web pages, but which is also disorienting. Layering itself aims at reducing disorientation by keeping the texts together, both the tour and the contents that are talked about, are on the same page. That differs from opening an added window, since added windows tend to get behind the window one currently views, and keeping track of the added windows interferes with relating to contents, while reading about them. Semi-transparency of the tour is also intended to support overview (of the contents talked about), and that is further supported by the possibility to hide the tour. To further support overview, the split/join pattern (Bernstein, 1998) could be implemented for the tour, having one path with just an index, and another path with headlines and text, with the possibility to cross over between the paths.

In layered blogging, the writer can talk about web contents, such as news in the blog entry used as a case here – and at the same time show the news item being talked about. As the reader moves along, reading the items in the blog, the contents that are talked about, can be switched in the background. In this case, the blog entry follows a story from several author points of view, and comments on why each point of view would be worth reading. The writer here avoids the citation problem of contents – that long texts or music clips are not just tedious to cite, but might not be legal to cite, due to copyright. Also, the contents are presented as they were, in the context in which they appeared. Also for blogs, it can be useful to refer to locations on the page, such as in this case the location of an audio file. But at the same time, the reader is also at the blog, which serves as an additional anchor on the page, and can move back and forth in the story told in the blog. This blog entry is similar to the counterpoint pattern (Bernstein, 1998), where two people respond to the same issue, in parallel, with equal weight. The difference here is that the counterpoint is complemented with other materials. That pattern would also be interesting for a discussion forum. Alternatively, someone could follow and

comment on some one elses tour / blog, implementing the mirrorworld pattern (Bernstein, 1998), to parallel or parody the main statements.

For discussion forums, the main advantage for the user might be that any page can be commented, not just pages having comment-functions. Also, the power balance shifts, from the owner of that site, to the owner of the discussion forum located elsewhere. Moreover, the same forum could be linked over several pages, rather than just one as in the case here. In this case, the forums are sequential, although a branching forum might also be interesting to try out. The layered forum is in this implementation maybe the one thing that differs the least from what we are used to today. However, the power balance issue should not be underestimated. There could also be a multitude of private and public forums spreading over different sites. I believe that layered forums might get more interesting in the context of being part of a larger set of forums, with possibilities to navigate between them.

Where two or more tours, blogs, or discussions converge, a contour (Bernstein, 1998) could be implemented, allowing people to switch over to another tour. A guided tour with entrance and exit can be used without any separate server keeping track of tours, since the tour can be loaded from a node controlled by the author. Also, the tour can be relatively static, compared to the blog and discussion forum. To implement a contour or mirrorworld, which is discovered when visiting a page being discussed, some mechanism is needed to keep track of what tours are present on a page. This could be done through trackback, or through a central tour server, detecting the presence of several paths on a page. That is already needed for discussion forums, which must be live for a discussion to carry on. The server has to keep track of new entries, and check whether pages have associated discussions.

There are also other system dependency issues. This approach to annotating web pages avoids the problem of the server round-trip. In some previous systems, each web page had to be loaded through a dedicated web server, for the annotation to be added (Sandvad et al., 2001). That both creates problems with bookmarking (do you bookmark the url to the real site, or the url for the annotated version?), and that also creates a bottleneck since all pages then have to go through a particular server. The approach taken here is instead to load each page normally, and add the annotation on the client side, after the page has loaded, avoiding the need to load the entire page through an annotation server. Thus this approach would seem to scale more cheaply in terms of processing and bandwidth.

Layered storytelling is a counterpoint to other current developments on the web that aim at opening services and web contents for subscription and remote usage. Syndication, such as RSS (really simple syndication), allows sites to export contents in common rss-formats. Open services allows sites to post contents to other sites – when an user posts contents at one social bookmarking site, that site can contain links for posting the contents at other sites as well. This makes the users less vulnerable to the loss of one of the sites, and such redundancy might well appear for layered storytelling as well. RSS and many open services are about exchanging information – taking it from several sites, and concentrate it to one site (e.g. RSS), or taking it from one site and sending it forth to other sites (open service calls). This is also different from many other types of user scripts, where contents instead are altered in a more formulaic fashion, maybe hiding some contents (such as advertisements), or altering a set of stores to also display prices of the same goods in competing stores, in a formulaic, automatic, fashion. Layered storytelling is instead about annotating existing sites, presenting own contents on top of other contents regardless of the site owners ideas, and creating paths through the web by associating different pages and sites with each other. Rather than gathering and dispersing contents, layered storytelling is about enriching and connecting contents.

Summary

In sum, whereas these kinds of hypertexts certainly, in a sense, have been possible to create with traditional systems (eg. Bonnie, Diane, Michelle, & Luke, 2004; Dave, Karadkar, Furuta, Francisco-Revilla, Shipman, Dash, & Dalal, 2003; Drenner, Harper, Frankowski, Riedl, & Terveen, 2006), layering aims at giving a different experience. This approach to layering also differs from using frames or systems that load contents through a dedicated server, in that bookmarking and other browser features are unaffected by the layering feature. The concepts described here are currently being tested and prototyped using the shapeCMS content management system. Thus, future studies will show how other people will experience and make use of layered hypertexts. The aim of this approach is to

enhance reader experience, by for instance provide better overview of a subject, through a guided tour path. While doing so, it appears important that the design of the tour also emphasize the values that are to be enhanced, so that the tour itself, for instance, provides overview of its own contents.

These developments show that the vision of the Memex (Bush, 1979) is becoming more and more real, at least for hypertexts. What is currently happening, although not at a very large scale, is that annotating and path creation on the web are becoming possible, and can be offered as services. In the vision of the Memex, once an annotation had been done, it would stay there until needed again. It remains to be seen whether such fixity can also be achieved for the world wide web. Layering, is the missing piece of the Memex vision, which allows the user to annotate and create paths through the web, rather than the site owner of specific sites. By adding yet another node to the web, serving web layers, the web of islands of different sites, become one unified web for people to annotate and create paths through, together.

Bibliography

- Bernstein, M. (1998). Patterns of hypertext, *Proceedings of the ninth ACM conference on Hypertext and hypermedia : links, objects, time and space---structure in hypermedia systems: links, objects, time and space---structure in hypermedia systems*. Pittsburgh, Pennsylvania, United States: ACM Press.
- Bonnie, A. N., Diane, J. S., Michelle, G., & Luke, S. (2004), Why we blog, *Commun. ACM*, **47**(12), 41-46.
- Bush, V. (1979), As we may think, *SIGPC Note.*, **1**(4), 36-44.
- Dave, P., Karadkar, U. P., Furuta, R., Francisco-Revilla, L., Shipman, F., Dash, S., & Dalal, Z. (2003). Browsing intricately interconnected paths, *Proceedings of the fourteenth ACM conference on Hypertext and hypermedia*. Nottingham, UK: ACM Press.
- Drenner, S., Harper, M., Frankowski, D., Riedl, J., & Terveen, L. (2006). Insert movie reference here: a system to bridge conversation and item-oriented web sites, *Proceedings of the SIGCHI conference on Human Factors in computing systems*. Montreal, Quebec, Canada: ACM Press.
- Garzotto, F., Mainetti, L., & Paolini, P. (1996). Information reuse in hypermedia applications, *Proceedings of the the seventh ACM conference on Hypertext*. Bethesda, Maryland, United States: ACM Press.
- Isakowitz, T., Stohr, E. A., & Balasubramanian, P. (1995), RMM: a methodology for structured hypermedia design, *Commun. ACM*, **38**(8), 34-44.
- Lundberg, J. (2006a). A web tour loader script for Mozilla Firefox / Grease Monkey. [<http://www.ida.liu.se/~jonlu/tourloader.user.js>], 2006, Aug 2
- Lundberg, J. (2006b). Web tours, for use in the web tour loader (requires the tour loader). [<http://www.ida.liu.se/~jonlu/index.htm>], 2006, Aug 2
- Marshall, C. C. (1998). Toward an ecology of hypertext annotation, *Proceedings of the ninth ACM conference on Hypertext and hypermedia*. Pittsburgh, Pennsylvania, United States: ACM Press.
- Sandvad, E. S., Grønabæk, K., Sloth, L., & Lindskov Knudsen, J. (2001). A metro map metaphor for guided tours on the Web: the Webwise guided tour system, *Proceedings of the 10th international conference on World Wide Web Hong Kong*, Hong Kong: ACM Press.
- Sastry, C. R., Lewis, D. P., & Pizano, A. (1999). Webtour: a system to record and playback dynamic multimedia annotations on web document content, *Proceedings of the seventh ACM international conference on Multimedia (Part 2)*. Orlando, Florida, United States: ACM Press.
- Zellweger, P. T. (1989). Scripted documents: a hypermedia path mechanism, *Proceedings of the second annual ACM conference on Hypertext*. Pittsburgh, Pennsylvania, United States: ACM Press.
- Zellweger, P. T., Bouvin, N.O., Jehøj, H., & Mackinlay, J. D. (2001). Fluid annotations in an open world, *Proceedings of the twelfth ACM conference on Hypertext and Hypermedia*. Århus, Denmark: ACM Press.

Figures



Figure 1: Annotation area on top of web contents



Figure 2. Guided tour



Figure 3. Blog entry