Interfacing the Collection

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Abstract

The digital age has led to the advent of electronic collections with millions or even billions of items. This paper examines the types of interfaces that are emerging for large-scale collections, specifically addressing what a large collection looks like online, and how it can be managed by users. In examining these questions, we propose some features that we feel are universally desirable in interfaces to collections. Overall, there appear to be two sets of features that help users effectively use and sort online content: tools to view, organize and navigate collections; and tools to customize and manage user-created sub-collections.

Keywords

Electronic collections; Large-scale collections; Interface; User-managed collections; Editable collections

The INKE Research Group comprises over 35 researchers (and their research assistants and postdoctoral fellows) at more than 20 universities in Canada, England, the United States, and Ireland, and across 20 partners in the public and private sectors. INKE is a large-scale, long-term, interdisciplinary project to study the future of books and reading, supported by the Social Sciences and Humanities Research Council of Canada as well as contributions from participating universities and partners, and bringing together activities associated with book history and textual scholarship; user experience studies; interface design; and prototyping of digital reading environments.

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Three desirable features in collection interfaces

We will focus on the following three features as being universally desirable in interfaces to collections:

a. That some overview of the collection itself is available.
b. That the collection is usefully organized in accordance with established purposes.
c. That a means for navigating from any point in the collection is provided.

We do not claim that these are the only desirable features of collection interfaces. Indeed, many others are offered by Bruce Tognazzini (2003) in his influential guide to interface design, *First Principles of Interaction Design*; however, in the interest of simplicity, we have identified these three as being of central importance in all collection interfaces. They will thus serve nicely as points of comparison for the various examples to be considered.

These features can be illustrated clearly by first looking at a small-scale textual collection (see figure. 1). Such collections have been available online since the very early days of the web. One early example of an online corpus that has survived on the web is MIT's edition of the complete works of Shakespeare, available continuously in a simple but effective format since 1993. This edition provides an example of a small vanilla corpus interface with a basic but functional feature set. The entire contents of the corpus are displayed at once, giving a complete overview of the collection (feature a) and the contents are organized into four columns based on genre (feature b).

Figure 1: Main interface, "The Complete Works of William Shakespeare" (Jeremy Hylton, 2010).

As for feature c – a navigation bar sits at the top of each page, showing the current position within a text and enabling quick access back to the homepage, the table of contents, and to the next or previous section of the work being viewed (see Figure 2). Due to the very small size of the collection, this simple but functional interface is able to provide an overview, to organize the collection in a way that makes sense of the collection for the user, and to provide local navigation.

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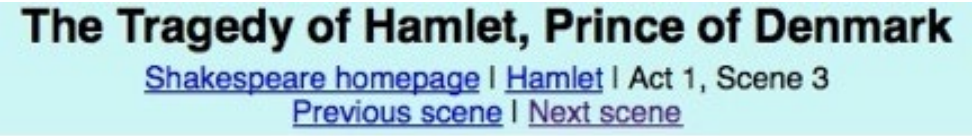

Figure 2: Navigation bar, "The Complete Works of William Shakespeare" (Hylton, 2010).

Interfaces to large collections

As the owner of some of the largest collections in the world, Google-owned interfaces provide several illuminating examples of the features of interfaces for large-scale collections. At one extreme there are simple interfaces like that of Google Search that force the user to type a term into a search box, and then provide a simple list of results (see Figure 3). Though Google Search may seem an odd example of an interface to a collection, it functions as such given that it is the medium by which a majority of people access an indexed corpus of billions of Web pages. While Google does not try to present an overview (feature a.), largely due to the size of the collection, it has organized the web into media types like images, maps, scholarship, books and so on. Although the interface Google provides has been known and appreciated for its minimalism (Reed, 2009), the company has recently added features, such as a small magnifying glass to the right of each result, which reveals a small preview of the associated page.

Figure 3: Main interface, "Google Search" (Google, 2010c)

The Google "Wonder Wheel" allows users to peruse semantically related search terms by use of a mind map style interface (see Figure 4). In this way, a limited overview is given, allowing users to browse keywords into the collection.

The Google "Timeline" feature graphs the use of search terms over time (see Figure 5). Users are thereby given additional information beyond what they would receive in a standard search. It should be noted, however, that all of these features are provided alongside a simple textual list, and cannot be used on their own. Although they do provide extra information and functionality to standard web searches, the simple textual list remains Google Search's primary interface.

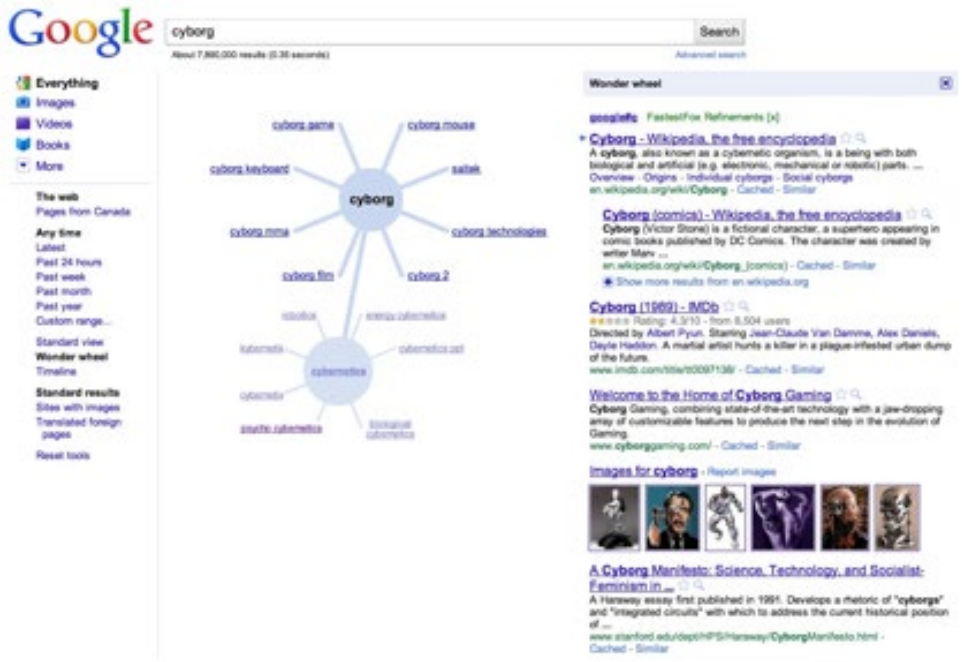

Figure 4: Wonder wheel, "Google Search" (Google, 2010c)

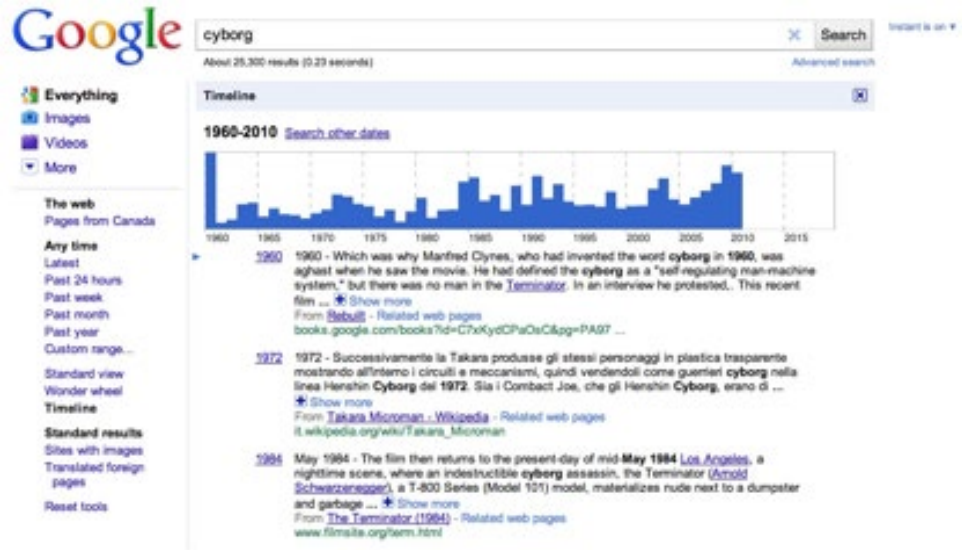

Figure 5: Timeline, "Google Search" (Google, 2010c)

Other search engines have attempted to provide more innovative methods of searching the web. For example, Redz shows screenshots of five websites at a time in a pyramidal construction (see Figure 6).

Search-cube provides a three-dimensional rotatable cube composed of snapshots of website results (see Figure 7).

Viewzi offers a number of ways of viewing results including as a grid, a series of screenshots, and as a photo tag cloud (see Figure 8).

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Figure 6: Main interface, "Redz" (Redz, 2010)

Figure 7: Main interface, "search-cube" (Symmetri, 2010)

Figure 8: Photo-cloud interface, "Viewzi" (Viewzi, 2010)

According to the admittedly partial source that is Google Trends, none of these sites are even visible when compared to Google on a graph measuring site traffic (see Figure 9). This suggests that for the time being, at least, the simple textual list provides the most popular interface for exploring web-sized collections. The fact that Google and other sites are making some attempts to implement visual features indicates that remain desirable, whatever the size of the collection.

Figure 9: Comparison of search interfaces, "Google Trends" (Google, 2010d)

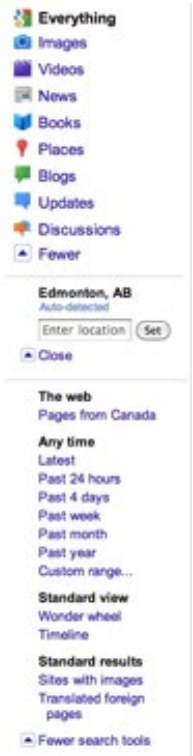

Figure 10: Filters, "Google Search" (Google, 2010c)

With regard to organization, Google has recently begun placing filters on the side of the page, allowing for more focused searching (see Figure 10). These filters can be thought of as ways to organize the results (feature b).

With regard to navigation (feature c), *Google* relies on browser functions. Once an item is clicked on, only the back button will return the user to the search interface (see Figure 11).

Figure 11: Back button, "Firefox" (Firefox, 2010)

A Google search bar may also be built directly into the browser (as is the case in major browsers like Safari and Firefox) (see Figure. 12). This provides a means to access Google's main interface from any point on the Internet.

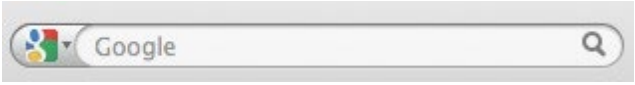

Figure 12: Search bar, "Firefox" (Firefox, 2010)

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YouTube constitutes a smaller but still massive collection, and also employs a search bar at the top of each page as its main navigational tool (feature c) (see Figure 13). It attempts to present a small representative overview of its collection by displaying a selection of videos organized according to category.

Figure 13: Browsing by category, "YouTube" (YouTube, 2010)

YouTube's filters can be used to narrow searches according to duration and other criteria. Results are displayed as thumbnails in a list alongside associated metadata (see Figure 14). The filters could be said to be organizing features (feature b).

Figure 14: Search results, "YouTube" (Youtube, 2010)

Rather than titles, which may be of questionable relevance, YouTube employs user-assigned tags for videos to aid in searching (see Figure 15). A list of pre-defined categories is also available, which users can choose from. True to its name, YouTube is organized largely from the bottom up by users themselves.

Figure 15: Categories and tags, "YouTube" (YouTube, 2010)

In addition to searching, a more traditional browsing feature is also provided by YouTube, allowing the user to browse by category (see Figure 16). If this option is used, a larger selection of videos is available at once, although this selection comprises a miniscule portion of the entire corpus.

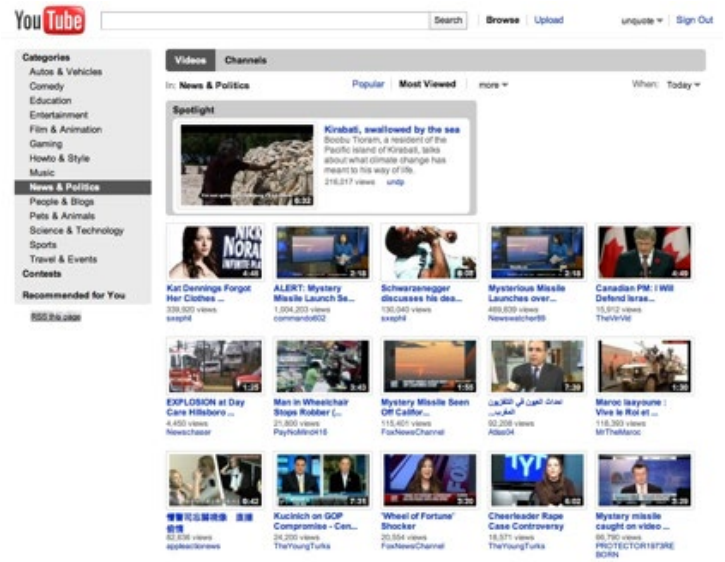

Figure 16: Browsing within a category, "YouTube" (YouTube, 2010)

Google Books, another multimillion-item collection (Crawford, 2010), has many features in common with YouTube. Although the entire collection can obviously not be presented at once, an attempt is made to provide a representative overview by showing a number of books to allow for browsing (feature a) (see Figure 17). Covers of books are displayed in rows as graphical thumbnails. As in the MIT Shakespeare, rows are organized according to the genre of the work.

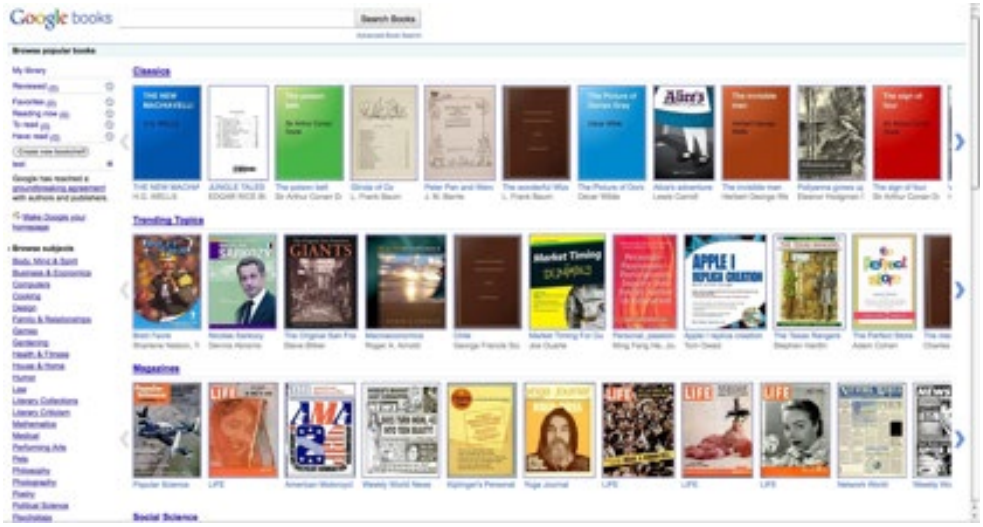

Figure 17: Main interface, "Google Books" (Google, 2010a)

A navigational menu featuring subjects is featured on the side of the homepage (feature c), although this does not appear on pages listing individual items (see Figure 18).

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Figure 18: Navigation menu, "Google Books" (Google, 2010a)

Instead, a search box is included as a navigational aid on every page, which is the principal method to explore this collection, as it is too large to be browsed in a detailed fashion (see Figure 19). An advanced search option is also available, allowing further precision.

Figure 19: Search box, "Google Books" (Google, 2010a)

Results are displayed in a list or optionally a grid, with thumbnails of covers along with metadata about the books, and links to more information (see Figure 20).

When Google Books and YouTube are compared to MIT's Shakespeare, it can be seen that all of them provide some kind of overview (feature a) and organization (feature b) to facilitate browsing the collection, although in the case of the larger ones, search bars are also provided and become the principal method of navigation (feature c). Results of searches yield a field of results and suggestions of related materials, providing another form of small-scale browsing based around keywords. Search bars are not essential for small corpora such as the MIT Shakespeare collection because the entire corpus can be viewed at once; however, these would still be useful as an alternative means of finding passages across the corpus using keywords, rather than browsing through each play. For example, someone may remember a character named "Jacques" but forget which plays have such a character.

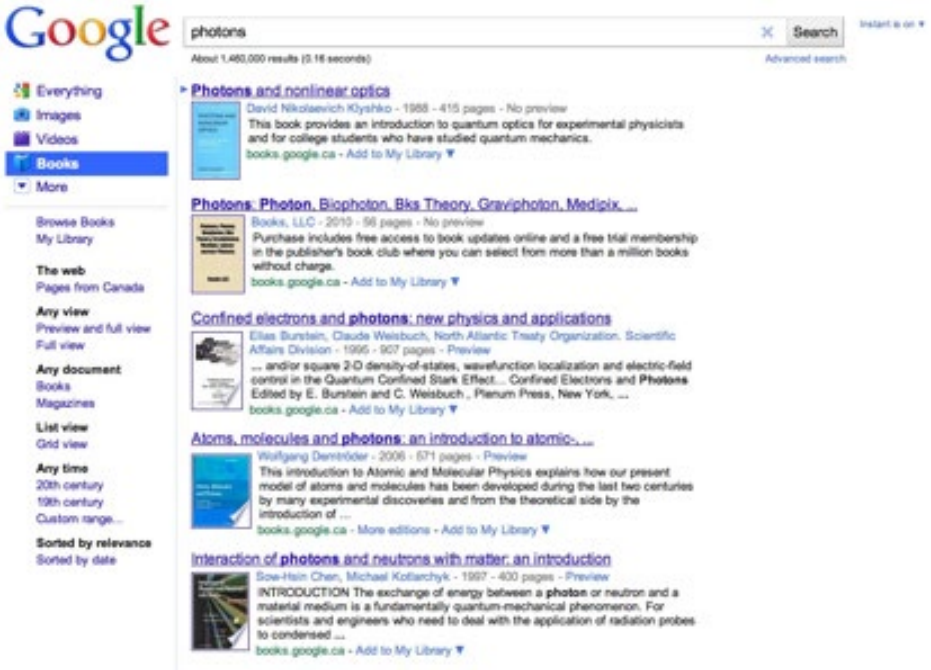

Figure 20: Search results, "Google Books" (Google, 2010a)

The innovative interface designs of Google Books and YouTube suggest that huge collections can benefit from design, and can even offer the three desirable design features outlined above, albeit in a more limited fashion than is available in small interfaces like MIT's Shakespeare collection.

Although interfaces to these larger static collections do provide limited degrees of organization and "browsability," large corpus interfaces become much more useful when they are customizable to user needs. To get the most from very large collections, users must to be able to carve out their own sub-collections that match their own interests and conform more closely to the three principles mentioned above. Both YouTube and Google Books have recognized this, incorporating into their designs mini-interfaces in which users design and manage their own sub-corpora. Google Books has created personal libraries that can be manually populated with books based on various criteria (see Figure 21); additionally, the user is given the ability to create new shelves based on their own criteria, and to store books on them.

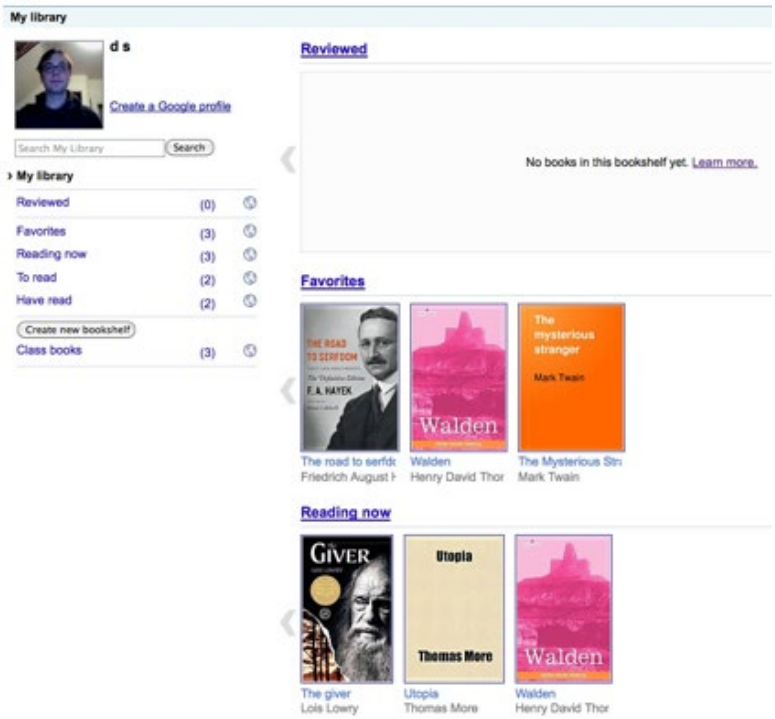

Figure 21: My Library, "Google Books" (Google, 2010a)

In the case of YouTube, users can create playlists. To create a playlist, the user can start by clicking on a small "plus" icon appearing in the bottom corner of each video when hovered on. When clicked, this icon allows users to add it to a queue that can then be played in any order the user specifies. Queues can be saved as playlists, and played later on (see Figure 22). The personal library and playlist features of these two collections provide all three of the features offered by MIT's Shakespeare collection: the ability to view an entire collection at once, organization of items in the collection according to useful categories, and the ability to navigate away from any point in the collection. The only difference between MIT's Shakespeare collection, and Google Books and YouTube is that the latter two interfaces are created and organized by users themselves by selecting resources from a larger collection.

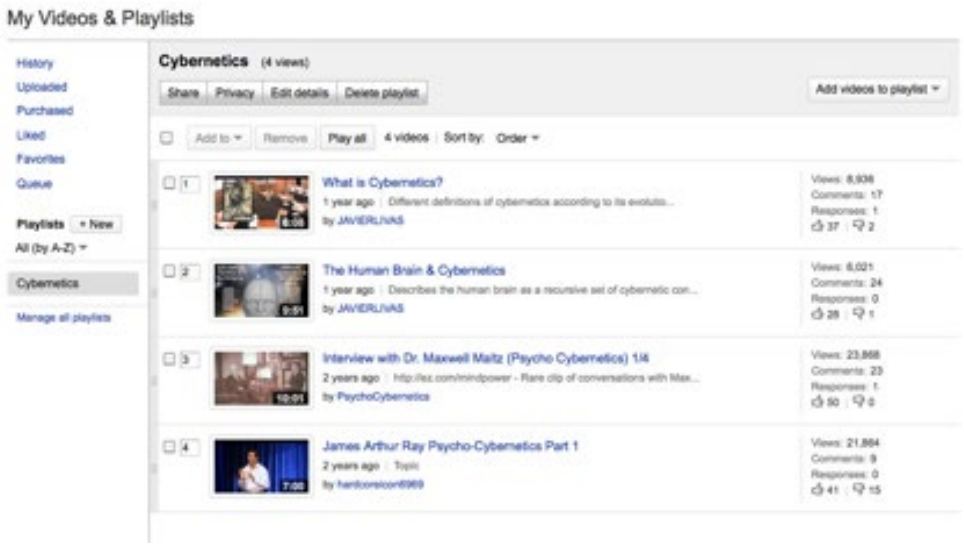

Figure 22: Playlist, "YouTube" (YouTube, 2010)

Such user-designed sub-collection interfaces might be seen as hybrids between ones that the user can only navigate, like MIT's Shakespeare collection, and ones that allow users to also create and manage their own corpora from scratch.

The Perseus Digital Library provides an innovative example of a large collection that does not include ways to customize it to user needs. Collections are divided into six main categories based on place and time period (see Figure 23). At the top level, collections are presented as a simple textual list of hyperlinks reminiscent of MIT's Shakespeare collection.

Figure 23: Main interface, "Perseus Digital Library" (Tufts University, 2010)

However, there are also some tools showing word counts and maps (see Figure 24) of the most frequently mentioned places in each collection, giving interesting overviews of the collection as a whole.

Figure 24: Map of places mentioned in all collections, "Perseus Digital Library" (Tufts University, 2010)

Clicking on a collection reveals a list of documents organized alphabetically by author (see Figure 25). Again, a word count of the collection is given, this time by language. Beside each document is an option to search it for keywords; various other tools, including dictionary lookup, art and archaeology searches, and named entity searches, are also available.

Figure 25: Collection-level interface, "Perseus Digital Library" (Tufts University, 2010)

It is within the documents themselves, however, that Perseus really shines (see Figure 26). Texts themselves are treated as mini-collections that can be divided up and viewed in various ways, such as by text, chapter, or section. Hyperlinked graphical bars show the user's position within the various levels of organization; these serve both to orient the user and to provide for easy navigation to other sections. A textual hyperlinked table of contents is also present, as is a simple search box. References to or by other authors are shown and linked to, notes on the text are provided if available, and other tools, such as a map of places mentioned, are given. A navigation bar always appears at the top, along with a search box for instantaneous collection-wide searching and navigation.

Figure 26: Document-level interface, "Perseus Digital Library" (Tufts University, 2010)

Results of searches at any level return results organized according to various categories, such as artifacts and images, with options to refine the search in various ways, and a results overview of the term as it appears in various documents (see Figure 27). The Perseus Digital Library can be seen as a model non-editable collection interface. Although it does not provide means for users to organize or customize collections in new ways, the quality of the overviews, depth of organization, and flexibility of the navigation system make it a satisfying and useful resource for the user. Nevertheless, Perseus seems to recognize the value of customizability, stating on its website that its "current research centers on personalization: organizing what you see to meet your needs" (Tufts University, 2010).

Interfaces to editable collections

This section will examine interfaces that allow users to edit and manage collections rather than simply browse them. A popular interface of this kind is Google Docs, a free suite of web-based applications that allows users to create and edit documents of various types online. The interface for Google Docs has all of the desirable features of interfaces for navigation-only corpora, and is even more customizable than Google Books' My Library and YouTube's playlist. Like MIT's Shakespeare collection, it offers a list view of the entire corpus, although, unlike the Shakespeare collection, it offers the ability to order and organize this list in various ways according to user preference. Like Google Docs and YouTube it offers a thumbnail-based interface as well, which can also be ordered according to various criteria (see Figure 28).

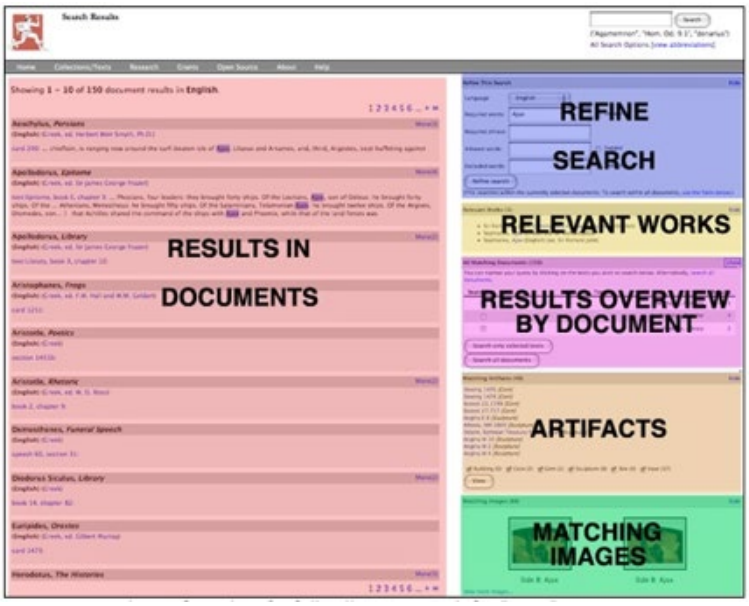

Figure 27: Diagram showing organization of results in Perseus, "Perseus Digital Library" (Tufts University, 2010)

Figure 28: Thumbnails, "Google Docs" (Google, 2010b)

Another feature it has in common with large collection interfaces is a search bar at the top, allowing users to search for keywords, as well as an advanced search function, allowing searches based on more focused criteria. Navigating back to the main interface can be done from any point in the collection by clicking on the Google Docs logo. Differences from more traditional interfaces include automatic saving and storage of different versions of documents, which can then be opened and edited and reverted to, if desired. The ability to change settings to allow specific users to view and edit documents is another difference, although this option is only available to a limited extent for user-made sub-collections in the other examples of large collection interfaces.

A different kind of a collection interface controlled by the user is JiTR (Just in Time Research), an experimental prototype developed in part by some of the authors of this paper (see figure 29), with support from the Social Sciences and Humanities Research Council of Canada[1]. This project allows users to create and manage collections for research and study. Three basic steps are involved. First, open-source crawlers, aggregators, and scrapers are used to gather materials from the web, based on user-defined linguistic or socio-cultural criteria. Second, knowledge is added to the text through the use of linguistic-processing tools, enabling linguistic analysis. Finally, there is an interface to remote tools provided for analysis. Basically, the user can run tools to build collections, process collections, and analyze subsets of collections.

Figure 29: Main interface, "JiTR" (Rockwell et al., 2010)

In JiTR, collections are displayed in a colour-coded list. Some collections are default ones that come with an account, like the "Help Collection." Descriptions of individual collections can be viewed by clicking on the appropriate icon; alternatively, collections can be opened by clicking on them. Within a collection, the user gets a list of the text, which can be sorted according to date, title, format, or location (see Figure 30).

Figure 30: Collection interface, "JiTR" (Rockwell et al., 2010)

Clicking on specific items within collections reveals the source text and a set of tools that can be used to perform various operations on the text (see Figure. 31). The interface also offers limited versioning, so that the user can reset a text to its original state when first collected. At the top of every page is a navigation bar, which links to the main interface and to other places, including the scraping and crawling tools. In developing this interface, a "Personas and Scenarios" model, as outlined, for example, by Alan Cooper (2004), was used. This model involved creating realistic personas that "act as stand-ins for real users" (Calabria, 2004, p. 1), and then designing a product with their needs in mind. Primary and secondary personas were developed, and various features were prioritized accordingly. By using this method, interface design can develop according to needs of imagined users from the very beginning[2]. In the end, JiTR was designed to support two types of researchers: a) those gathering materials off the web for cultural research; and b) those editing collections of texts.

Figure 31: Item interface, "JiTR" (Rockwell et al., 2010)

One of our more recent projects concerns the development of "structured surfaces" that can help users understand the organization of items in a collection, and which allow a user to interact with the collection. By a structured surface, we mean a cognitive artifact that provides a layer of meaning that supports the data imposed upon it. Imagine that your items, instead of being on a plain table, could be on one with coloured regions, or on a table with depressions for holding different items. These regions on the surface could attract items or repel them. In terms of our three desirable features of interfaces, the idea behind structured surfaces is to give users more power to control the overview, organization, and ways of navigating their collections. People are familiar with several conventions for structured surfaces, such as maps, timelines, radar plots, and targets, but it is also possible to recognize the Cartesian coordinate system (see Figure 32) as a generic structured surface, which generalizes nicely because it allows the designer to specify the meaning of the axes.

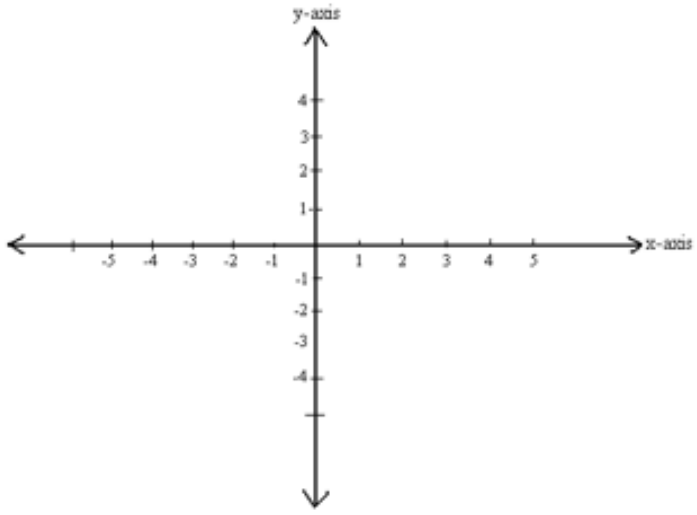

Figure 32: The Cartesian coordinate system: a generic structured surface

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We can, however, extend this thinking into diagrams where an additional cognitive layer is introduced underneath a given data display in order to help the user to mentally structure the information. The following example shows a mash-up of content provided by JiTR with a structured surface inspired by Florence Nightingale's rose diagram (see Figure 33).

Figure 33: A Florence Nightingale-inspired structured surface

The surface is composed of wedges, which we can imagine in this sketch as representing months, and a series of segments subdividing the wedges, which might be used to represent cause of death. That's where the original information graphic ends, but we propose adding an additional layer of information. In this case, imagine that the dots represent medicine shipments. Alternatively, the dots could represent the individual deaths of soldiers from Shropshire, or the number of ambulances with flat tires. In the context of JiTR, depending on the user's metadata, the entire graphic might be conference proceedings, where the wedges might represent genre, the segments authorship, and the dots are individual people who were at last year's conference.

This next example shows a mash-up using a tree-map as the structured surface, and a cloud of dots, or bees, layered over top (see Figure 34).

Figure 34: Tree-map and dots – another structured surface

For interpreting this sketch, imagine that the tree-map is made up of countries, pre-selected by the user, and the swarms of bees represent trending twitter topics. The user can select how many twitter topics to display at any one time. The number of bees in a swarm and the amount of movement within a swarm indicates the amount of twitter excitement or activity. The user can select a time period and then watch the swarms as they grow, shrink, move and change. He or she can also use the timeline on the right to rewind to a particular point in time, then playback the swarm or twitter activity.

It is worth noting that the structured surface could be one of a number of preexisting visualizations. Our intention is to experiment with Stanford's excellent collection at Protovis.com. We feel that the third layer of information represented by the dots in the first example, and by the bees in the second example, provide an exciting opportunity for people assembling dynamic collections to feed into the text analysis tools available through JiTR.

Conclusion

In this article we have considered a wide variety of interface ideas for collections. Some general conclusions can now be made. First, although all collection interfaces appear to benefit from overviews, useful organization, and easy navigation, these features become much harder to implement in very large collections. Innovative methods of implementation have been devised, and include filters, graphs, and creative visualizations, but search tools still rule. Collection size is thus a limiting factor with regard to implementation of interface features, such as the three basic ones outlined here, as well as more complicated designs like structured surfaces.

A remedy is to provide users with the ability to create customizable sub-collections that are small enough to allow for overviews and organization. Such sub-collections share the feature of customizability with another class of collection, namely the fully user-managed collection. Due to their relatively small size, user-managed collections typically possess all three of the desirable interface features. Additionally, their customizability allows users to further optimize them to suit project- or collection-specific needs. Methods of further customization are now being developed under the rubric of "structured surfaces" that hold the promise of beautiful and functional interfaces with all three of our desired features. In the electronic world of massive collections, the answer to Crane's (2006) question of "what to do with a million books" seems to be twofold: to give users tools to view, organize, and navigate the collection as a whole, but also ones to customize and manage sub-collections themselves.

Notes

1. See http://tada.mcmaster.ca/Main/MashTexts

2. To see the final personas and how we imagined them using this collections interface, see http://tada.mcmaster.ca/Main/MashTextsProcess

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