
Implementing New Knowledge Environments (INKE)

Publications

The Provision of Digital Apparatus for Use in Experimental Interfaces

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The Provision of Digital Apparatus for Use in Experimental Interfaces

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Abstract

In this article, we discuss the various ways in which the experiments we have been doing within the INKE Interface Design team and elsewhere are predicated on the availability of “digital apparatus” – various forms of metadata that can be made consistently available. These include structural, procedural, and semantic markup, digital indexes, textual variants, annotations, regularized citations, and taxonomies of references, to name a few. While some affordances are agnostic to the very existence of metadata, in some crucial instances the metadata is essential. The question we hope to address in these cases is the extent to which the new affordances are actually of sufficient potential benefit to the community to warrant being produced and maintained.

Keywords

INKE; Digital texts; Human-computer interaction; HCI; Digital humanities; Humanities computing

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Introduction

The development and maintenance of metadata has been a central concern of the library and information studies community since its inception. Ranging from books shelved according to the name of the historical bust sitting on top of the bookcase, as was often the case in early British libraries (Brown, 1898), on down to the Dewey Decimal system and faceted browsing, the combination of affordances for both searching and browsing have been given due attention.

However, with the advent of digital records and digital documents, many projects have been faced with decisions regarding how much and what kinds of metadata should be kept. On the one hand, we might say the more the better, since it is clear that new tools can emerge from the metadata available (Ruecker, Radzikowska, & Sinclair, 2011). In fact, since it is widely accepted that an XML encoding is a form of interpretation (Hockey, 2000), capturing and disseminating various encodings could become a central interest of the digital humanities.

Unfortunately, with metadata comes cost, both in terms of development and storage. Without clearly defined intended purposes for the information, it is difficult to justify the additional work and complexity. It is a catch-22 in some ways, since experimentation with new tools emergent from the metadata is contingent, at least to a certain extent, on having some metadata to consider. In the Implementing New Knowledge Environments (INKE) project, we have been privileged to work with a number of research partners in obtaining the kinds of metadata necessary for prototyping.

INKE was defined with two primary goals:

- Contribute to the development of new digital knowledge environments.
- Combine the traditional strengths of print with the advantages of digital environments in order to produce integrated digital reading tools.

In both cases, the emphasis is on the environment, the package of integrated tools. It focuses on the larger context, which goes beyond the individual experimental prototype and into the ways in which the scholarly community may benefit from having a larger system available.

INKE, however, remains primarily a research project, and as such, it is important for us not to lose sight of the future. We are working toward an image of a system that does not yet exist, but that might have the potential to allow us to do so much more than we can do now.

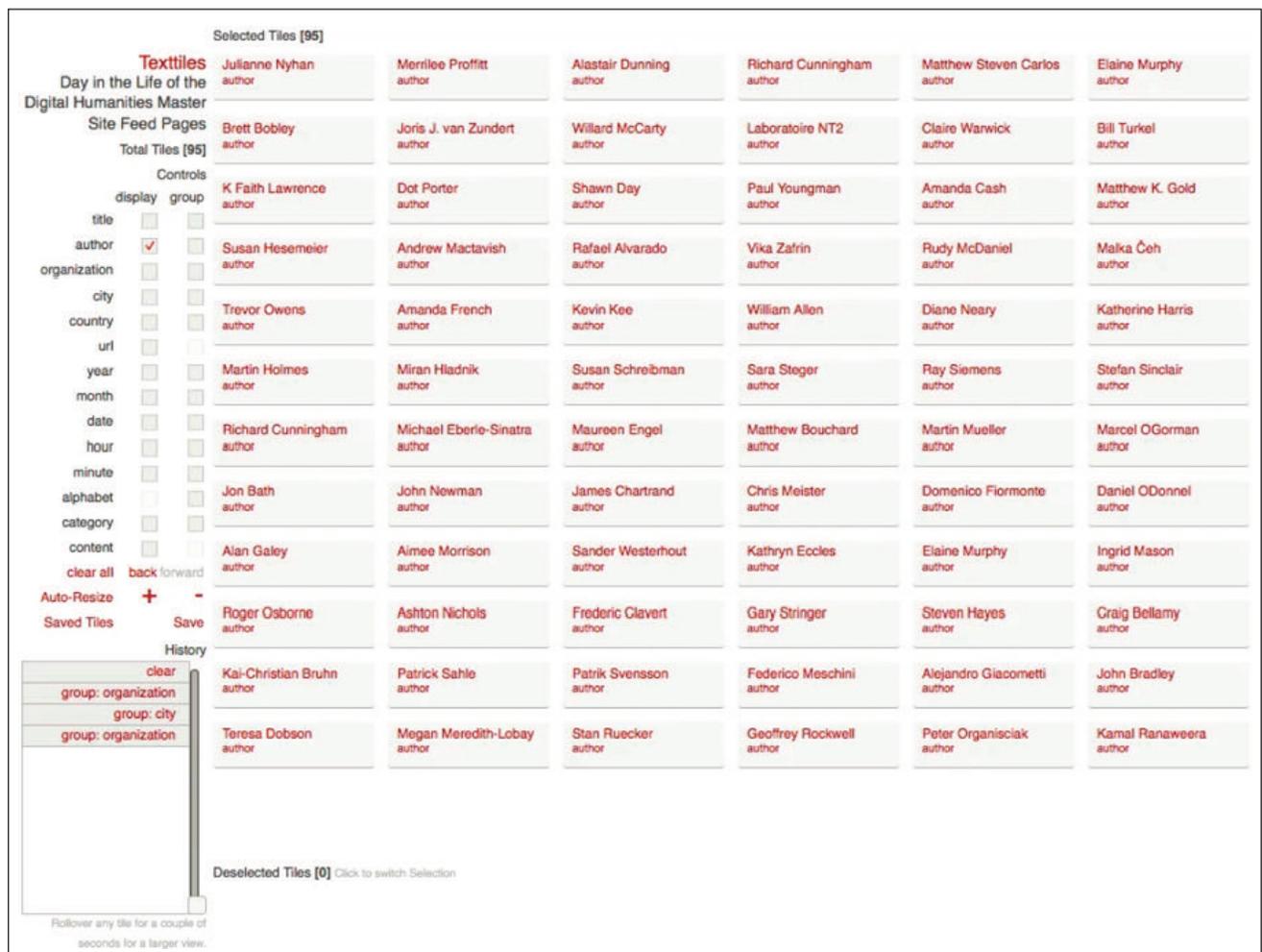
INKE therefore stands in contrast to projects like the Text Analysis Portal for Research (TAPoR) and the more recent Canadian Writing Research Collaboratory (CWRC), which were defined from the beginning as national infrastructure projects. Where the goal of INKE is to imagine, prototype, and test our way into a better understanding of what needs to be done, the goal of TAPoR, CWRC, and a variety of similar infrastructure projects around the world, is to take the current state of the art and make it available to the scholarly community.

The distinction is important to keep in mind, in part, because the partnership roles vary considerably between the two approaches. For an infrastructure project, the partners work toward industry standards. They contribute data and metadata for improved access and use by the scholarly community. For a research project, on the other hand, the partner organizations are extending their reach into the future, combining their existing knowledge of best practices with the research goal of moving toward the next generation of best practices. This more speculative role can sit somewhat uncomfortably for some partners, who are conscious of limited resources. However, for the field to progress, both kinds of commitment are necessary.

Record headers/bibliographic information

We deal more completely with possible uses of citations below; however, document description metadata, such as appears in Text Encoding Initiative (TEI) headers or library catalogue records, has a number of potential uses in interactive visualization experiments. First is the browsing environment, where the goal of the reader is to get a sense of what is in the collection. An example of this kind of use is the TextTiles project (see Figure 1), where metadata providing document descriptions is used to populate an array of small boxes that can be interactively changed both in terms of how much metadata they display and how they are organized on the screen.

Figure 1: The TextTiles browser shows some of the bloggers from *A Day in the Life of the Digital Humanities*, 2009.

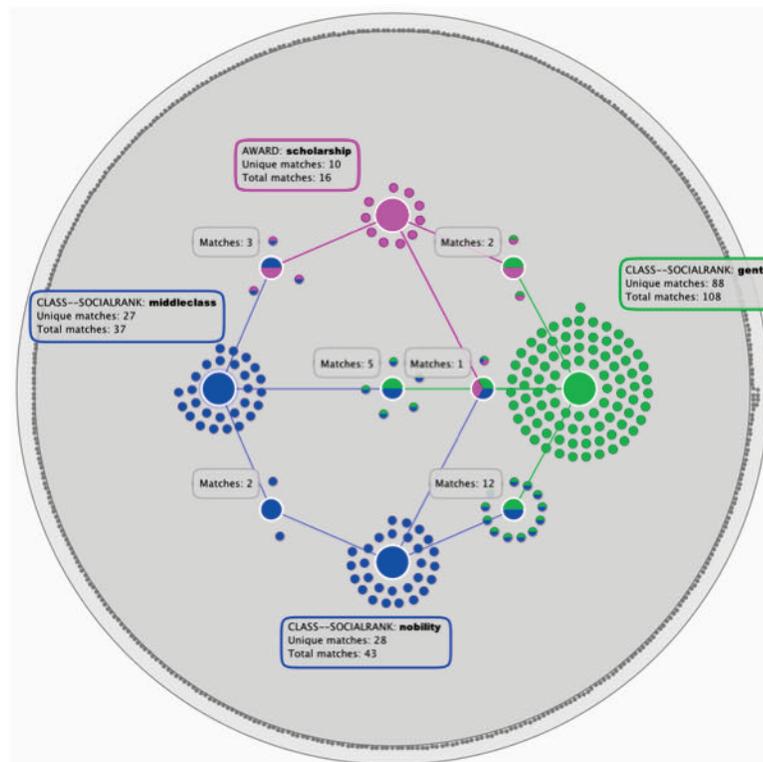


As with many prototypes in the digital humanities (DH), TextTiles also includes a reading panel that can be used to examine the original file. Although there is some utility in having document descriptions separated from their contents, it has become recognized as a DH best practice to keep the contents ready to hand whenever subscription rights or other copyright concerns make it possible.

Structural markup

Primarily of value in formatting XML for reading purposes, structural markup can also have a role to play in interactive visualizations. In the Mandala Browser (see Figure 2), for example (Orlando Project, 2006), we rely on the structural markup as a means of deciding how best to subdivide the file into the “dots” that constitute the core unit of analysis. It is important in structuring an interview, for instance, that the question be somehow associated with the answer, so that the answers are not showing up *ex nihilo*. Similarly, in studying plays, it is useful to have the name of the character associated with the speech.

Figure 2: The Mandala Browser with dots indicating biographies of British women writers extracted from the structural markup of the Orlando Project.



Without structural markup, it is not possible to make decisions about how best to divide a file. Instead, it is necessary to accept a default division that is ready to hand, such as paragraph breaks.

Semantic markup

Having some higher-level intelligence available in the metadata opens up opportunities for new affordances. That is, if we know more when we are designing a prototype, we can think of more things that can be done. In the Bubblelines visualization (see Figure 3), for example, the reader can see comparative search results across multiple documents, or across multiple parts (e.g., chapters) of the same document. Of general use for anyone doing string searches, the tool becomes more powerful when working with material that has been previously prepared using XML encoding to address some particular research question.

Figure 3: This Bubblelines screenshot shows the first few letters in Richardson's epistolary novel *Clarissa*, for which the researcher Susan Liepert has developed and encoded an XML schema that captures various indications of emotion and emotional interactions.



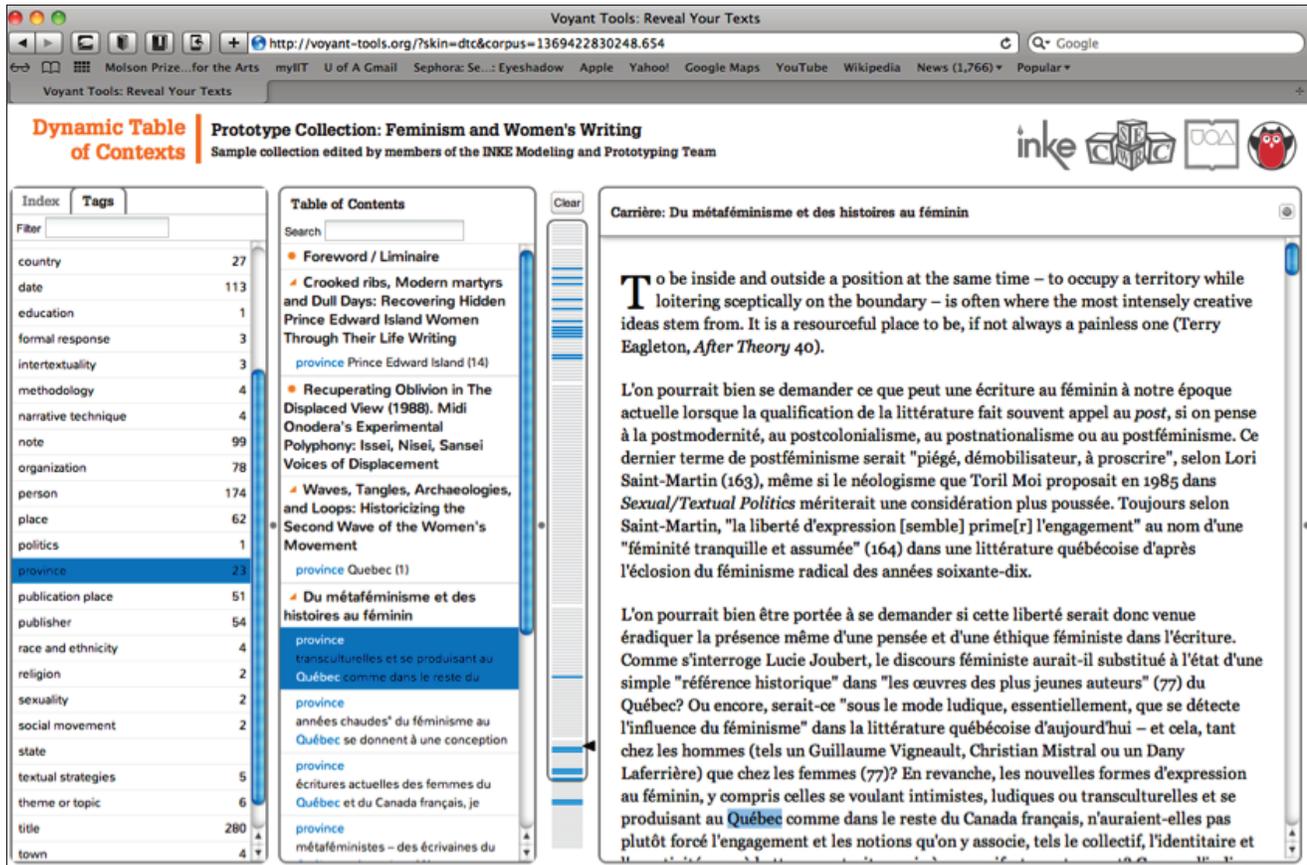
By providing encoding that is relevant to the interpretation being pursued, the researcher is able to identify patterns across the document that would not otherwise be easy to see.

Digital indexes

Although indexes have become less important in digital texts, which can be searched easily, it is still recognized that they serve a role distinct from both string searching and semantic encoding. The former will not identify every place where a relevant concept has been discussed without using the particular words used for searching. The latter is primarily of use where repeated instances of a higher-level concept or function category can be used to constrain a search to terms within that category. For example, someone might look for mentions of other titles generally in a document, or constrain that search to only titles that appear within an <intertextuality> element.

In terms of providing an affordance for visualization, we have used digital indexes as a way of extending the functionality of the Dynamic Table of Contexts (DToC) (see Figure 4), so that the reader is able to interactively add and subtract index items into the table of contents.

Figure 4: The Dynamic Table of Contexts allows readers to choose items from the semantic markup, the index, or free-text searches to add to the table of contents.



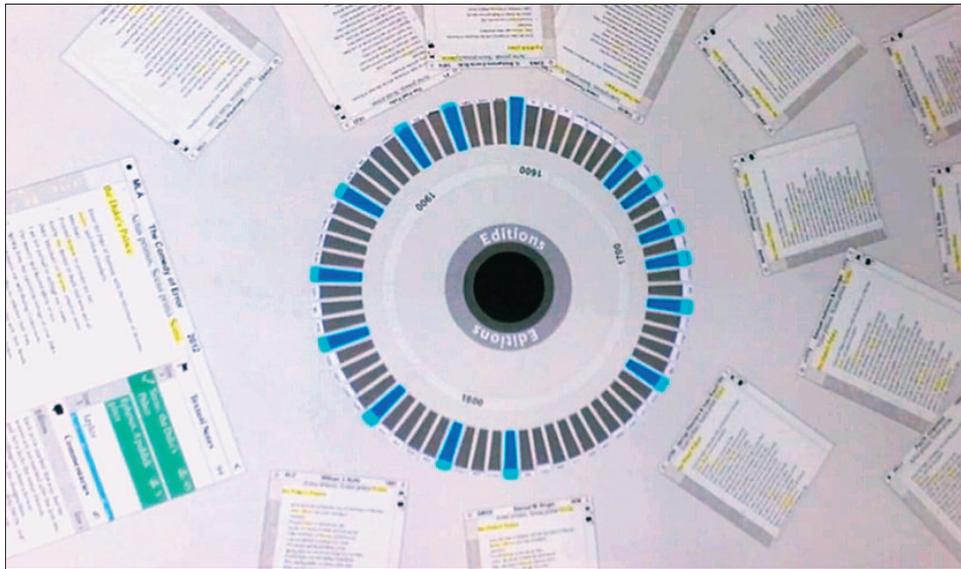
While some believe that free-text searches are adequate for most purposes, both semantic markup and digital indexes provide the benefit of bringing additional human intelligence to the text.

Textual variants

For canonical or otherwise privileged source texts, the record of textual variants has been of significant concern to the scholarly community for many centuries. The current industry standard for preserving knowledge of textual variants is the variorum edition, where the goal is to record within a single volume all of the most important variations of the text that have ever appeared in print. As the basis for these editions, it is becoming increasingly common to use a custom XML schema.

The prototyping project where we began experimenting with this schema was called the MultiTouch Variorum (MtV) (see Figure 5). Our goal was to produce an interface on a large touch surface that would allow real-time collaborative editing of a new edition, created by a small group of people working with all the previous editions. In

Figure 5: The MultiTouch Variorum provides a reading and editing system on a touch surface for multiple simultaneous users.



our scenario, they would be physically present at the same time and working together on the table. We believe that this is not the usual current method of scholarly editing, and so hoped to offer a new affordance.

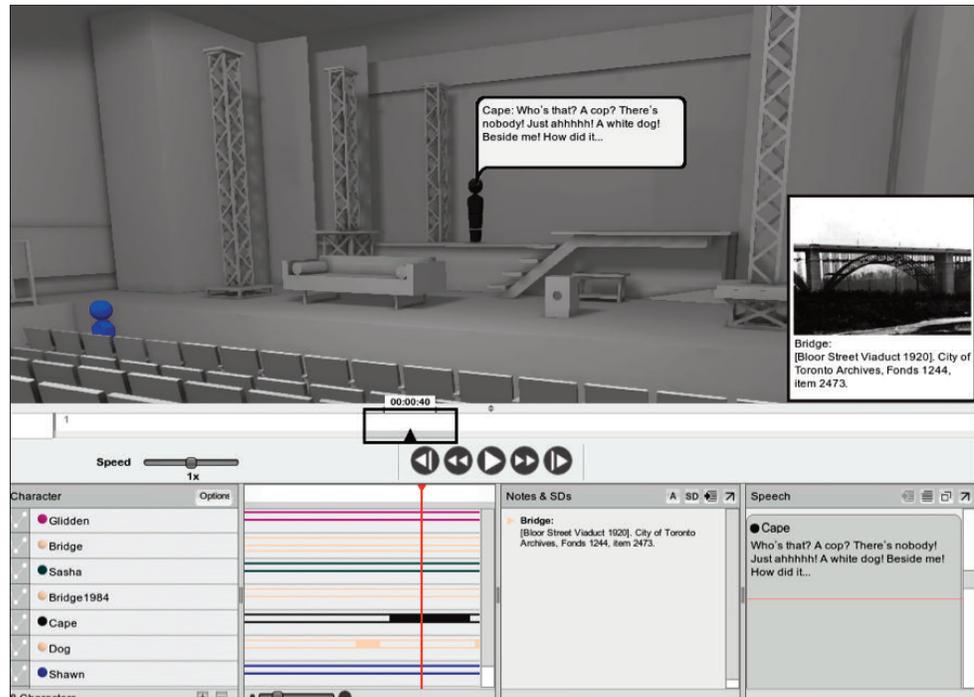
One of the challenges of the MtV editing environment was to create a system that did not privilege any of the edges of the table, while nonetheless making the working materials available to everyone. A previous version showed a row of items that was duplicated across all the edges; the current iteration has a single set of items placed on a carousel in the middle.

Digital annotations

It has been widely recognized in the DH community that annotations have an important role to play historically and are gaining increased importance in the growing availability of social editions (e.g., Marshall & Bernheim Brush, 2004). One of the most common contemporary forms of digital annotation is in the comment threads associated with various primary source materials, such as a video, blog post, or tweet. When they are serving as a specialized form of conversation, annotations can provide the basis for visualizations that attempt to provide a structure for recalling, discussing, and analyzing conversational patterns and topics. Alternatively, annotations may take a more scholarly form (see Figure 6), where their purpose is to add information to a digital object.

For example, in the Simulated Environment for Theatre (SET) project, we developed a number of ways of supporting people interested in watching stylized versions of plays. The ability to turn on annotations, whether in the form of text, images, or video, significantly enriches the system from the perspective of a theatre historian interested in examining the stage model, character blocking, and other features in a context that also makes scholarly annotations readily available.

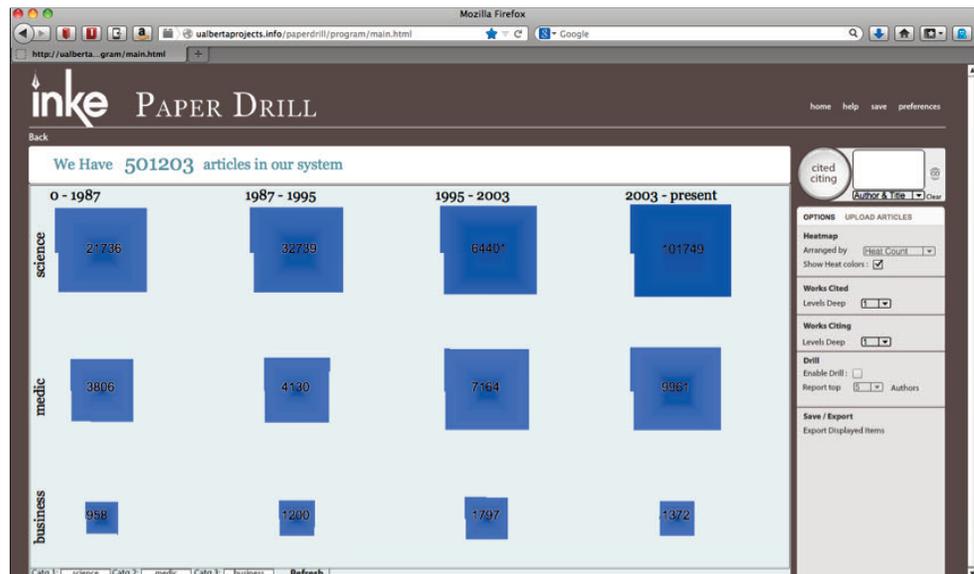
Figure 6: This prototype shows the Simulated Environment for Theatre with an annotation open on the right of the stage.



Regularized citations

From the beginning of INKE, when our topic was interdisciplinary citation, we have been experimenting with the productive visualization of citations. Our first prototype, called the Paper Drill (see Figure 7), was intended to allow researchers to begin with a seed article, and use the system to generate a report of which authors were most frequently appearing, following a chain of citations originating from that article. Citation chaining of this kind is a venerable approach to information identification, surpassed only in the last few decades by digital searching of keywords.

Figure 7: The Paper Drill homepage.



The main difficulty with the Paper Drill prototype is that it requires bibliographic information for every citation in every paper, down to the level of detail of article title and author names. Moreover, it will work best if the citation metadata has been regularized in an intelligent way, so the system can recognize, for example, that Bill Buxton, William Buxton, and William Arthur Stewart Buxton are all the same author, but William J. Buxton is a different author working in a different field entirely.

The current state of the art of citation metadata in the humanities, however, is that it largely does not exist. Citations are typically embedded in PDFs. We therefore spent some time in INKE looking at ways of parsing PDF files in order to get citation lists, but the results were mixed at best. In the end, we opted for testing using regularized citation metadata that was readily obtainable for papers indexed by the ISI (now Thomson Reuters) Web of Science.

There are a number of possible reasons for the lack of citation information in the humanities. One is that it requires time, effort, and perhaps even some text-mining capabilities. Second is that, unlike in the sciences, the humanities tend not to place much, if any, weight on citation indexes, since citations are used differently in the humanities than in the sciences, where there is a greater emphasis on identifying recent key papers. Furthermore, a list of top citations in the humanities will almost always begin with names of “primary source” authors such as Shakespeare and Milton.

Our argument for the development of citation metadata is to help students and researchers who may be new to an area to identify central articles and authors. Unfortunately, it is difficult to estimate how much time is spent in citation chaining by scholars each year. We therefore extended our work into further potential uses of citation metadata.

Figure 8: CiteLens is a multitouch application that allows readers to explore several elements of citations that are not typically available, such as how the author has used them in constructing an argument.

The screenshot shows the CiteLens application interface. At the top, the browser address bar shows the URL <http://labs.fluxo.art.br/CiteLens/>. The application header includes the CiteLens logo and navigation options: "I would like to **compare** contextualize citations of The Care of the Dead in Late Antiquity: Eric Rebillard, 2009." Below the header, there is a search bar and a list of citations on the left. Two comparison panels are visible in the center, each with a title "Add comparison set" and a plus sign. The left panel is for the citation by Delehaye, Hippolyte (1933) and the right panel is for the citation by North, John (1992). Both panels have filters for language, country, publication type, period, and function. The right panel also displays a snippet of text from the citation, discussing the development of religious pluralism and the impact of these groups in traditional Greco-Roman society.

Taxonomies of references

The prototype that relies on semantic encoding in references is called CiteLens (see Figure 8). It is a system intended to help scholars examine the use of citations, primarily not between academic papers, but instead within the context of a single monograph. We believed that if it were possible to produce the right combination of tags, we could develop an environment where the reader could look at the references from other perspectives beyond the alphabetical listing by first author's last name.

In addition to the standardized citation metadata needed by the Paper Drill, CiteLens also leverages more semantic tagging, specifically involving the context of use of a citation and its intended purpose as a form of evidence for the argument being made. That is, citations play a rhetorical role in scholarly articles, and CiteLens is a tool to help people trace that rhetorical trajectory.

Conclusion

Some metadata is produced during the creation of a resource, some is added after creation, some is provided manually, and some can be automatically generated. The least expensive of these in terms of production is metadata that is automatically generated at the time of creation. Currently we can expect, for instance, that our computers will keep track of the date that we first created a file and the date that it was last modified. It can do a pretty good job of recognizing the file type, since we specify those in the file extensions that are typically attached by the creating software.

It is not hard to envision, however, a time when more metadata could be automatically associated with a file, and in particular with the kind of files we are typically working with in projects like INKE: text files. It could perhaps also be associated with other media, but primarily text. We might, for example, expect to have parts of speech attached to every word. Named entity recognition could become standardized to the point that any name mentioned would be associated with information about the person or place. Further, we might find contextualizing information, such as how common a particular name was in the year that our named entity was born or created.

Each addition of this kind provides the opportunity to design new affordances for people working with digital text. The benefit of doing this on a large scale is that automation and standardization can come to play a role, hopefully making the choice of experimental dataset more interesting and the data itself more robust.

Websites

Bubblelines, Montreal, QC, <http://docs.voyant-tools.org/tools/bubblelines/>

Canadian Writing Research Collaboratory, Edmonton, AB, <http://www.cwrc.ca/en/>

CiteLens, Edmonton, AB, <http://www.artsrn.ualberta.ca/inke/projects/citelens/>

Dynamic Table of Contexts, Montreal, QC, <http://voyant-tools.org/?skin=dtc&corpus=1391532658789.4848&docId=d1391532101107.od5601c8-bb2d-4bbb-179e-d4769947167a&inkeTags=true>

Mandala Browser, Montreal, QC, <http://mandala.humviz.org/>

Multitouch Variorum, Edmonton, AB, <http://vimeo.com/70527973>

Simulated Environment for Theatre, Montreal, QC, <http://humviz.org/set/>

Text Analysis Portal for Research, Edmonton, AB, http://www.tapor.ca/docs?name=about_tapor

TextTiles. London, UK, <http://dev.giacometti.me/textTiles/trunk/>

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