12.

Close and distant reading in explorative editions: distributed cognition and interactive visualisations

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The unfulfilled promises of the digital edition

In 2016, Joris van Zundert argued that the digital scholarly edition had barely moved beyond a remediation of the print edition into the digital medium and lamented that 'we limit its expressiveness to that of print text, and we fail to explore the computational potential for digital text representation, analysis and interaction' (Van Zundert 2016). In this essay, I will show how digital editions can become what I call 'explorative' editions, editions that come equipped with effective visual tools for exploring and making sense of the edited material. These tools can integrate and make palpable knowledge about the edited material and allow entry into the edition. They exemplify what has been called 'distributed cognition' (Lyman 2009) and enhance the value of the edition as a cognitive artefact (Norman 1991). The overview that these tools offer provides a distant reading lens on the edited material, while the provided access points into the edition create the connection between close and distant reading that is essential for humanistic study.

Current text editions are certainly dynamic and interactive in a way the book format could not support, but Van Zundert is right in the

sense that this interactivity is really limited: we can choose whether we want to see an image aligned with the text, we can select the text version we want to see, we can opt to underline references to entities in the text and we can search. There is no doubt that these facilities are useful, but it still remains true that it is the reader who has to do most of the work to make sense of the edited text and the editorial labour hidden away in the text's presentation. And this need not be the case. Peter Robinson already in 2004 called for 'lean-forward editions', editions where '[n]ew systems of data analysis might offer ways into all this material, and so permit us to see patterns and relationships always there, but never before accessible. In turn, we could use the explicatory power of the computer to allow readers to discover these, just as we do for ourselves' (Robinson 2004). Ray Siemens and others called for text analysis facilities to be included in the electronic edition (Siemens 2005). John Unsworth listed a series of options for humanities computing to go beyond representation of texts and other artefacts (Unsworth 2004). And while it is known that visualisation has the 'capacity to leverage human visual performance, enabling users to effectively perceive patterns in data' (Heer and Shneiderman 2012), and there exist a wide array of studies into visualisations of humanities data (Jänicke et al. 2017), we are hardly seeing these interactive visualisations integrated into digital editions. Indeed, many studies show visualisations built on texts taken from scholarly digital editions, but somehow these visualisations seldom make it into the digital edition itself (for example, Walsh and Hooper 2011; Mandell 2013; Barbaresi 2018; Tóth 2013).

To be fair, the situation seems to be slowly improving. Many digital editions or collections now contain maps or timelines. In the edition of the diaries of Andreas Okopenko[1] places in the diary entries are shown on maps and from the maps we can get at the relevant diary entries (Tezarek 2020). The edition of Melville's Marginalia[2] contains integrated facilities for text analysis (Melville's Marginalia Online 2022). Integrated in the collection of the Saint Louis Circuit Court

1 https://edition.onb.ac.at/okopenko/. All sites inspected 1 November 2022.

2 http://melvillesmarginalia.org/.

Records[3] there is an (incomplete) network visualisation[4] of court cases and the persons involved. The case nodes are linked to the cases' records in the edition. Evina Stein and the present author created an edition of the early medieval glosses to the first book of Isidore's *Etymologiae*[5] that includes interactive network visualisations which illustrate how clusters of glosses were transmitted between manuscripts (Stein and Boot, forthcoming).

Distributed cognition, interactivity and transparent tools

Eugene Lyman, in the third chapter of his PhD thesis *Assistive Potencies* (Lyman 2009) – the thesis up to now went largely unheeded but this chapter should be required reading for everyone working on digital editions – uses the model of 'distributed cognition' to explain how especially visual features in digital editions can enhance the edition's usability as a knowledge tool. Distributed cognition views cognition 'as a distributed process that involves the interaction of an individual's internal cognitive capabilities with culturally constructed elements in the surrounding environment' (101). Lyman quotes Pea (1993) as stating 'On close inspection, the environments in which humans live are thick with invented artefacts that are in constant use for structuring activity, for saving mental work or for avoiding error, and they are adapted creatively almost without notice. These ubiquitous mediating structures that both organise and constrain activity include not only designed objects such as tools, control instruments and symbolic representations like graphs, diagrams, text, plans and pictures, but people in social situations, as well as features and landmarks in the physical environment' (102).

3 http://digital.wustl.edu/stlcourtrecords/.

4 https://talus.artsci.wustl.edu/courtRecordsSvgViewer2/svgViewer.xhtml?file=FINAL_extractRelationships_v2.svg.

5 https://db.innovatingknowledge.nl/edition/.

Even though Lyman stresses the importance of visuality and visual patterns, he is not predominantly interested in visualisations in a more limited sense, the illustration of quantitative data in charts and diagrams. For Lyman, his views' implications for design are primarily associated with 'cuing attention, marking location, and the targeted visual display of digital images (...)' (116). Lyman wrote his thesis to explain his thinking in developing the Elwood viewer, written as a tool to access the Piers Plowman Electronic Archive. The concept of distributed cognition, with its ramifications in cognitive psychology, allowed him to understand retrospectively the choices he made in the design of the Elwood viewer. Understanding the scholarly edition, print as well as online, as a cognitive artefact, helps us see how the edition provides 'assistive potencies', facilities that allow us to overcome the limitations of our unaided perception, memory and reasoning. To give an example: a traditional critical apparatus is already a cognitive artefact, as it brings together readings from multiple manuscripts which we no longer need to consult, transcribe and collate ourselves. But, as Lyman argues, the traditional presentation of the apparatus, where textual variation is described by lemma, is really unhelpful when the researcher's interest is in patterns of co-variation among lemmas over the various manuscripts. In response to that, the Elwood viewer offers multiple views of the apparatus, including a tabular view of full lines from the manuscripts, one word per cell. At least at the line level, we now at a single glance can see the differences between manuscripts.

As in this example, many of the design decisions for the Elwood viewer were motivated by a desire to '[replace] a more lengthy internal cognitive process by a single call upon the individual's powers of visual perception' (104). A similar effect is reached when the traditional parallel view of facsimile and transcription is enhanced with a view of the transcription line placed immediately above the relevant manuscript fragment, diminishing the cognitive work required to compare transcription and manuscript line. For this view of visual perception as a tool to help us think, Lyman is also indebted to Colin Ware's *Visual Thinking for Design* (2008). Ware opens his book by stating 'We should think about graphic designs as cognitive

tools, enhancing and extending our brains' and 'Visual thinking tools are especially important because they harness the visual pattern finding part of the brain' (ix).

Lyman quotes Ware's description of the computer functioning as a 'coprocessor' to the human brain: 'Low-bandwidth information is transmitted from the human to the computer via the mouse and keyboard, while highbandwidth information is transmitted back from the computer to the human for flexible pattern discovery via the graphic interface' (114). This exchange between human and computer, the human directing the computer to produce visual cognitive representations to be assessed by the human, brings Lyman to the topic of interactivity. In the rest of the chapter, he describes patterns of interactivity in the Elwood viewer – you can read a note at the bottom of the page or the end of the volume but from the perspective of maintaining focus and cognitive efficiency it is preferable to display it as a pop-up on a mouseover – but does not explore the concept's implications at a theoretical level.

Shane McGarry's PhD thesis *Expanding the Frame* (2020) continues where Lyman leaves off. He studies the importance of specifically interactive visualisations in the Digital Research Environment (DRE), a term that subsumes the digital scholarly edition. The theoretical background to his study comprises Goal Directed Design, an extension of Activity Theory. Activity Theory is a concept from psychology imported into Human Computer Interaction (HCI) to investigate subjects with the capability to act upon objects and to produce an effect (22). Goal Directed Design stresses that human actions proceed from goals and that an understanding of these goals is essential to good design. The main interest of the thesis is in how these design decisions affect how people can learn from DREs. McGarry uses a constructivist approach to learning, where learning is, among other things, active, constructive, intentional and authentic (which in this context means: properly contextualised, in real situations).

McGarry argues that searching is more cognitively stimulating than reading, and then writes: 'data visualisations are one mechanism that

can lead to [a] more robust search and browse experience, but only through the application of interactivity. Interactivity offers the reader the opportunity to truly engage with the data by immersing her in the *experience* of the data. This immersion leads not only to further understanding and comprehension but also increases her self-efficacy' (74). Immersion is seen as the subjective experience that is the result of engagement with the data. In line with the constructivist approach this can only be the result of a (goal-directed) human being acting upon an object and therefore of tooling that is interactive. This interaction is not conceived as an interaction merely within the visualisation, such as zooming in on a map or clicking to see an object's name, but through the visualisation to the underlying object. Interaction should '[further] the engagement of the user with both the visualisation and the source material by allowing her to seamlessly move to the underlying source' (96).

This turns the interactive visualisation into a tool for exploring the source material of the edition and making sense of it. An example would be the VarifocalReader tool (Koch et al. 2014), which displays in various side-by-side windows a scan of a book page, a transcribed text with highlightings for various categories of information, a set of word clouds per chapter section, a table of contents and an overview of the entire text of the work, with the same information categories highlighted. The approach lets users inspect document-internal hierarchies, possibly enhanced by a topic modelling technique, as well as the results of various searches and selections, 'drilling down' to the individual page or back up to the highest-level view. The tool shows some similarities to the 'Dynamic Table of Contexts' researched in the INKE project (Ruecker et al. 2014). In that project, a table of contents is enhanced with XML-based contextual information or search results to make it more informative, providing more overview information, while maintaining immediate access to the (edited) text.

As an activity of sense-making it can be argued that visualisation is related to the activity of modelling in Digital Humanities as investigated by Willard McCarty in *Humanities Computing* (McCarty

2005). The visualisation is an expression of the model of the source material that the researcher has come up with. In interaction with the visualisation, the user of the edition gets to know both this abstract model and the source material in so far as it fits the model. By manipulating the visualisation, the user engages in what McCarty describes as 'thinking by doing' (McCarty 2005, 45), attending from the tool to the entity it comprehends (44).

As an example, let us look at the edition that McGarry has worked on, that of the *Alcala record books*. One of the visualisations that a user of McGarry's proposed research environment can produce is a pie chart of, for example, total expense by year (McGarry 2020, 115). This is only possible because year and expense are dimensions of the abstract model for the record books that McGarry has created. Similarly, a simple text search is only possible if the model includes a representation of the source as a text string. A page of thumbnails is possible only if the model of the source knows about pages and page images.

The possibilities offered by interactive visualisations are a field of scholarship in themselves. 'Visual Analytics' is defined as 'the science of analytical reasoning supported by interactive visual interfaces' and received a boost from the US government after the World Trade Center attacks of 2001 (Thomas and Cook 2005, 4). It is also a field where different groups of researchers have different priorities: as Dimara and Perin (2019) note, when judging the merits of interactive visualisations, researchers from the visualisation community tend to prioritise their potential for insight, while researchers from HCI prioritise ease of use. In an ideal world, these priorities would not be in opposition; in the real world, we may need to strike a balance between the two. An important point that McGarry makes is that insight and ease of use depend on persons' thinking styles, and that in this respect humanities scholars and visualisation developers may have different preferences. As Arias-Hernandez, Green, and Fisher (2012) argue, interactive visualisations do not augment cognition by themselves, they are mediators for human actions on objects and 'the locus of cognition is human activity, not the isolated individual

mind or the material artefacts' (that is, the interactive tool, 14). This cognitive activity is situated within personal, disciplinary and cultural contexts (see also McGarry 2020, 29). Ideally, as McCarty writes, the tool becomes transparent to awareness, it becomes an extension of the body (44). Whether, when, for whom and to what extent the interactive visualisation can become this invisible mind/body extension is the basic question that research such as McGarry's is beginning to answer (see also, for example, John 2022; Heimerl 2017).

Explorative components in the digital edition

All digital editions facilitate exploration to some extent: they can be searched, they usually have tables of contents linking to various sections, various text versions are hyperlinked to their witnesses and to each other, apparatus entries and notes are accessible from the text. This may be enhanced by links to outside resources, index entries for persons or objects mentioned in the text, and so on. Any such hypertextual edition can be 'explored' in the sense that it is possible to, haphazardly or more systematically, click your way around the edition, thus getting to know the edited material. There is no doubt these are valuable facilities. However, as McGarry notes, the process of 'hyperreading' also has disadvantages (McGarry 2020, 43 ff.). It places high demands on the user's working memory and attention, and may cause cognitive overload, especially in users with lesser abilities.

More importantly the hyperlink edition does not help in creating overview, it leaves all the work of sense-making to the user. For example, a traditional variant edition allows us to inspect the individual variants, but it does not help us answer questions such as how heavily the author reworked a certain printing or whether the variants are concentrated in certain chapters. As another example, an edition of correspondence will allow us to select letters by correspondent, but if we want to compare the volumes of correspondence exchanged with different correspondents, it will force us to pick up

a piece of paper and write down the results of multiple selections. These emergent properties, that is, properties not of individual items in the editions but properties at a higher level, is what the edition should also make accessible. Elsewhere, I have described these properties as 'too big for the naked eye' and argued the edition should provide a 'megascope' to see these larger properties, invisible at the level of a single text (Boot 2008).

Given these limitations of the hyperlink edition, I believe it makes sense to reserve the name 'explorative edition' for editions that use the interactive visualisations discussed in the previous section. I propose to call an edition explorative to the extent that it contains visualisations that:

i. contain visual representations of relevant properties of items of the edited material;
ii. these representations can be manipulated;
iii. these representations create a top-down and preferably also bottom-up navigational structure through the edition;
iv. these representations are co-extensive with the items edited in the edition (all items are represented and accessible);
v. these representations minimise the amount of time, physical interaction and cognitive labour required for understanding and acting upon the represented information.

I provide explanations for each of these four points. I also point at some examples of sites that lack the feature. That should not be construed as negative commentary. The sites that I mention are forerunners and the comments that I give are just suggestions.

Ad i. The items may be represented individually based on some property (such as letters on a map based on place of sending or charters on a timeline, based on their date), but they may also be included in some aggregation (such as letters in a bar chart by sender or apparatus entries in an overview by chapter). The represented data may also be the result of some computation (say, a chapter located in a topic modelling network or a graph of 'emotional

temperature' by chapter). In all cases, the properties are an expression of the editorial model of the text and its genesis. Sometimes the visualisation will incorporate the result of earlier user actions (say, a display of search hits in a visual representation of an entire work).

Ad ii. The representations can be manipulated in the sense that the user, in order to better understand the edited text(s) or its/their history/ies, can filter the texts to be taken into account for the visualisation, can select the properties to be displayed, can choose aspects of the layout such as a colour scheme or a network layout algorithm and so on. The *Letters 1916–1923* project is an edition containing nice visualisations of networks and maps that does not fulfil this second criterion. It is a pity, as the project originally was quite aware of the potential functionality beyond that of a 'pretty picture' (Hadden 2016). As it is, the pictures only provide very limited help in understanding the collection. An edition, on the other hand, with a network display that does allow some manipulation is the collection of April fool letters to Mark Twain[6] (see Myrick and Ohge 2017).

Ad iii. The existence of a top-down path to the content of the edition implies that by making use of the visualisation(s) a user can get from the visualisation to the displayed contents. That is to say: from the map I can get to the letters and from the character network I can get to the scenes where the characters appear. A bottom-up path from the letter would take me back to the map, with the sending place of that letter highlighted; a bottom-up path from the scene would perhaps take me to the same character network visualisation, now filtered by the characters that appear in that scene. The top-down version of this criterion is met only rarely. In the Okopenko diaries and the Saint Louis Circuit Court Records mentioned above, diary entries or court cases are accessible from the visualisation. The bottom-up version, in the case of maps, is pretty common. Elsewhere, it is seen rarely or not at all.

6 https://scholarlyediting.org/2017/editions/aprilfools/intro.html.

Ad iv. This criterion is meant to ensure that all texts or entries in the edition are accessible from a single visualisation. If this criterion is not met, the visualisation fails in providing an overview of all the edited text. An example of a site lacking in this respect is the Melville Marginalia site mentioned earlier. It contains beautiful visualisations based on Voyant. But an important limitation is that at present these visualisations are only shown for individual books. That means that someone who is new to Melville's marginalia will have to pick a book, essentially at random, and can only then begin to explore. It would have been better to have some visualisations at the home page, for instance displaying the numbers of different types of annotations per volume, so that the reader could start with the volume most likely to show some interesting marginalia.

Ad v. This final criterion will to some extent depend on user preferences. But there are certainly some objective aspects to it. For instance, the map of locations in the Okopenko correspondence initially shows no name for many locations. To get a name and other information one has to click the place mark, then some information appears. Apparently, the references to the diaries are fetched from the database at that moment and only appear after a noticeable delay. Using a mouseover and precomputed references would make this tool much more usable. It would also help if it would be possible to select an entire region rather than a single location.

Distant reading is using computational tools in the service of learning about the texts

In a polemical article from 2017, Katherine Bode took Moretti, Underwood and Jockers to task for their ahistoric approach in distant reading (or macroanalysis) (Bode 2017); in her view they ignore that the historic corpus is not a given, that it is constructed out of messy and incomplete collections, and doing computation without taking into account the constructed nature of concepts such as genre is reductive and naive. In that respect, she argues, distant reading makes the same mistakes that the traditional advocates of close

reading made: of ignoring textual scholarship. Rather than doing distant reading, she argues we should be doing 'data-rich literary research', and the appropriate context for this is 'the foundational technology of textual scholarship: the scholarly edition' (79). What we would need for this to become reality is a scholarly edition of a literary system. At that point of the argument, we may become sceptical (what exactly is a literary system? And how likely is it that you could edit an entire system?), but it is interesting that Bode sees the edition as a proper environment for data-rich research.

I would also argue that 'distant reading' and 'data-rich research' are almost synonymous. Distant reading, in current usage, is no longer specifically about literary history, or even necessarily about history. It is generally equated with using computational tools to visualise aspects of the texts. For example, Jänicke et al. (2017) characterise distant reading by saying 'It aims to generate an abstract view by shifting from observing textual content to visualising global features of a single or of multiple text(s)' (227–8). Buurma and Gold (2018) use it as a synonym of 'computational text analysis' (139). According to Alharbi, Cheesman, and Laramee (2022), distant reading 'aims to provide an overview of the text by moving from an in-depth exploration of the individual components of the text to presenting the global features of the text(s)' (1397). Hammond (2017) defines it as 'the computational analysis of large quantities of literary texts' (abstract) and Drucker (2017) as 'the computational processing of textual information in digital form' (629).

A notable dissenter among these voices is Ted Underwood, who describes distant reading as 'the practice of framing historical inquiry as an experiment, using hypotheses and samples' (Underwood 2017, par. 2). To my mind, Underwood is using the (popular) concept of distant reading as a label for a much wider phenomenon, the tradition of empirical research into literature. That tradition is important, but I don't think it is well served by describing it as distant reading. Distant reading looks at texts alone and, for example, a sociological approach to literature couldn't possibly be described as a form of distant reading. Yet Underwood is making an important point, by

describing distant reading as a 'practice of inquiry'. If distant reading were just 'computational processing of textual information in digital form', as Drucker writes, she would be right in her dismissive conclusions about distant reading (what distant reading lacks is critical distance). Distant reading should be defined not as the application of tools to digital text, but as reading, as a practice of inquiry that uses visualisations of global features (Jänicke) and computational text analysis (Buurma and Gold) in the service of acquiring knowledge about the text, in the context both of study and of scholarly inquiry.

Reading is defined by McGarry as 'the process of constructing meaning from written texts (…) a complex skill requiring the coordination of a number of interrelated sources of information' (35–6). Distant reading, as a type of reading, is therefore an active process, in which a goal-directed individual (someone who pursues learning) uses and manipulates the (output of) computational tools to construct meaning. The inclusion of computational tools in an explorative edition facilitates integrated close and distant reading in the edition and therefore the productive use of that edition.

A conclusion and a challenge

In this essay I have argued that digital scholarly editions can become much more intuitive than the present click-and-search paradigm allows. By appealing to our perceptual faculties they can visually present summarising information that we can ingest in a fraction of the time that we would need to process the same information in discursive form. These visualisations are the expression of the editor's model of the text and can often be deduced from information already encoded in the edition's source file(s). By adding interactivity to these visualisations and linking them to the textual features that they result from, the visualisations can become a tool for getting to know and making sense of the contents of the edition.

Why then are we not seeing many of these interactive visualisations in actual editions? Perhaps healthy scepticism is one answer, lack of

imagination may be another. Probably, there are also many projects with good intentions that, when the money runs out, prioritise a complete and trustworthy text over what may be seen as fancy tooling.

In view of this scarcity of visualisations, I want to end this essay with something that may be unusual in a scholarly publication: a challenge. I challenge the editorial community to come up with a useful interactive visualisation that fulfils the five criteria mentioned above. I promise a reward of €100 (as an Amazon voucher or any other voucher if preferred) to the first project to publish a scholarly edition containing such a visualisation. This must not be a proof of concept but a completed edition, freely accessible to the public and hosted by a public institution. Decisions about usefulness and about whether the required amount of time, physical interaction and cognitive labour has been sufficiently minimised are mine alone. Decisions are final. I cannot wait to receive your submissions.

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