AnnotateVis: Combining Traditional Close Reading with Visual Text Analysis

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Abstract— Close reading is an important research method to analyze and interpret text in traditional humanities research. In the last decades, a huge amount of historical texts have been made available due to large scale digitization projects and facilitated distant reading methods. In the last decade, a number of visualization techniques were developed that support distant reading tasks as they aid to explore large text collections. But, less work has been done to improve the close reading capabilities of humanities scholars, and the majority of existing techniques are either advanced text viewers highlighting textual features, or they are specific to particular research tasks. We propose the close reading tool AnnotateVis that supports the annotation of text fragments with various media types (audio, video, images, etc.). In addition, a user can perform various text analysis methods for a desired text snippet, and the results can be annotated in the form of an interactive visualization. To illustrate the utility of AnnotateVis, we provide two close reading scenarios.

Index Terms—Close Reading, Annotation tool, Distant Reading

1 INTRODUCTION

Textual analysis is a fundamental practice in different disciplines of humanities research to analyze historical texts and narratives. Since the early twentieth century, Close Reading has been one of the significant research methods to analyze text in traditional humanities research mainly literary criticism [15]. Close reading has a long tradition. It goes back to Aristotle who close read the works of Plato [21]. A definition of close reading is given by Nancy Boyles [6]: Essentially, close reading means reading to uncover layers of meaning that lead to deep comprehension. Although the close reading is steered by the scholars intellectual thought process, there are several techniques, methods and theories to approach it [7]. Close reading constitutes of a range of methodologies e.g.: multiple readings of the text, placing the text in its historical and socio-historical context, looking for patterns (e.g., repetitions, contradictions and similarities), finding inherent topics and occurring relationships, etc. Traditionally, close reading is done on paper. Annotating the text is considered as a strong facilitating method in a close reading process [27].

At the end of the twentieth century, there were great advancements in the field of computing. There was keen interest from humanities scholars and computer scientists to digitize historical texts for preservation purposes and to support collaborative work on those digital editions. This cooperation established the digital humanities field an intersection of computer science and humanities. A huge amount of historical texts were made available due to large scale digitization projects and provided the scholars working in the digital humanities with a number of fascinating prospects. With huge text sources and corpora available, the digital humanities revolutionized textual analysis methodologies in comparison to classical methods. Instead of focusing on a single piece of text, there was a growing desire to explore this sea of historical texts and discover trends and outliers. A major boost to this thought was given by Moretti, when he pioneered the term Distant Reading [24]. The idea of distant reading was put forth by Moretti from the fact that there are just too many texts to be seriously read and studied. In our survey [17] we define distant reading as in contrast to close reading as follows: While close reading retains the ability to read the source text without dissolving its structure, distant reading does the exact opposite. It aims to generate an abstract view by shifting from

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observing textual content to visualizing global features of a single or of multiple text(s). In his book, Moretti showed different illustrations in form of graphs, maps and trees - thereby advocating the use of visualizations for distant reading tasks. After Moretti published his idea, a number of visualization techniques were developed in the context of digital humanities, as summarized in our survey [17]. We were also able to show that the method of distant reading was gradually embraced by the digital humanities community and the majority of developed visualization techniques aided the exploration of large text collections. We further observed that less work has been done to improve the close reading capabilities of humanities scholars. The majority of existing close reading techniques acted merely as advanced text viewers highlighting textual features. On the other hand, there are close reading tools, e.g., TRAViz [18], Poem Viewer [1] or Poemage [22], that are pertinent to a particular research task.

Even after rapid developments in distant reading, our survey showed that close reading still remains a prior task in humanities research. Even in digital humanities projects that aimed to develop a distant reading technique in the first place, it was very important for the involved humanities scholars to actually see the underlying text sources, which is a mandatory functionality in order to verify distant reading hypotheses and to build trust in the novel research approach. That visualization can play important role to support the close reading of texts has already been shown by [13], who proposes so called word scale visualizations and annotates individual words computationally with statistical or geographical information. We propose AnnotateVis, an enhanced close reading tool that rather supports the traditional close reading workflow of humanities scholars digitally, i.e., by being able to annotate and highlight text fragments using various methods. In addition, we provide various visual analysis methods for desired text snippets in the close reading environment. The design of the tool is inspired by mind maps, putting the text in the center of the screen and arranging user annotations strategically around it to support the scholars individual intellectual thought process.

In the section 2, we illustrate the traditional close reading approach using annotations and observe existing tools that support annotating digital texts. In addition, we discuss how the close reading experience can be enhanced by providing various distant reading views on the text. In section 3, we discuss the design and features of AnnotateVis, and in section 4, we provide two usage scenarios that illustrate the benefit of our approach.

2 RELATED WORK

Close reading is a process where the humanities scholar carefully reads and interprets a text. In order to facilitate the understanding of a text fragment, annotating the text to highlight as well as to record

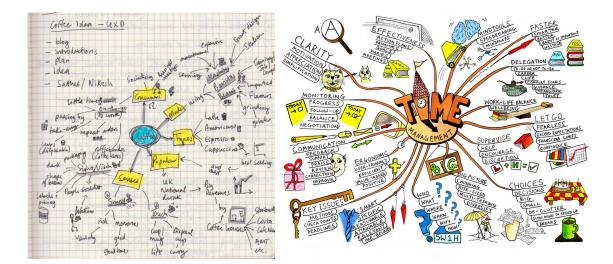


Fig. 1. Example Mind maps (left) Drawn on paper [11] (right) Drawn using a mind mapping software [23]

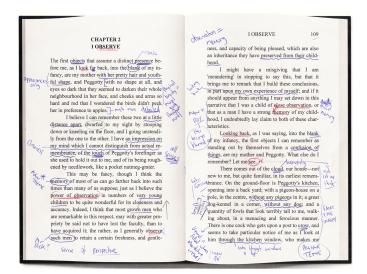


Fig. 2. Traditional close reading on paper [20]

thoughts, observations, findings and conclusions are key features in a close reading process. In a traditional close reading on paper, the scholar uses the margins alongside the text for annotation purposes. But as the margin space is naturally limited, not all observations can be put around the text. So, annotations may become cluttered and confusing for the reader, especially, when obsolete ideas are struck through. Despite its disadvantages, annotating on paper is still quite popular as it benefits the scholars to record observations about the hypothesis and all these changes reappear in front of the scholars eyes as soon as he re-reads the text passage. Fig. 2 shows a traditional close reading by use of annotations. In this example, various annotation methods were used by the scholar to annotate various features of a text passage in Charles Dickens' *David Copperfield*, e.g., the usage of different colors (blue, red, green) and underlining styles (straight or wavy lines, circles).

The availability of digital texts has further awaken the interest of humanities scholars in collaboratively close reading the same texts. There are several annotation tools for such a purpose, such as eMargin [20], Hypothes.is [5], NB [31] and Pundit [14]. These tools are beneficial for collaborative research and classroom environments as they provide an excellent paradigm to share thoughts, as well as find collective answers. To avoid clutter, these tools work with popup windows that are only shown on demand. Digital Ink Annotations

systems [2, 4, 28, 30] also support annotating text, but their use is only limited to pen-based computing devices such as tablets. The systems are designed to work well on smaller screens, and the adaption to larger screens is not appropriately implemented.

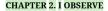
That close reading tasks can also be assisted via distant reading tools has been shown in various works. For example, parallel coordinates, a heatmap and a dot plot are used to analyze the variance of a selected text passage from different German translations of Shakespeares Othello [12]. Heat maps are appropriate visualizations to illustrate the distribution of specific phrases or annotations in a corpus [3, 25]. Voyant tools allow the user to perform basic text mining functions with selected word statistics shown in linked views [29].

3 ANNOTATEVIS

As evident from the techniques described in the previous section, some work has been done to support the analysis of single texts. On the one hand, web-based annotation tools highlight important text features and support collaborative discussions of close readings with others. Similarly, text analysis tools provide specific distant reading text perspectives. We introduce AnnotateVis, a web-based close reading environment that combines well adopted features of existing tools, but specifically allows humanities scholars annotating a text digitally like she is trained: in a traditional close reading fashion. For a profound text interpretation, we provide a number of text analysis methods coupled with various distant reading visualizations to illustrate the results. As our dedicated user group is not used to work with complex tools (reference: Gibbs), we tried to design AnnotateVis as easily comprehensible and intuitive as possible.

3.1 Design and features

The design of AnnotateVis is inspired by mind maps and is explained in our design paper [10]. A mind map [9] is a diagram that organizes information around a central subject. It has a radial structure with the main theme represented as a central node. All ideas and thoughts to the discussed theme branch out from this central node. Example mind map are shown in Fig. 1. Line thickness, text width or the coloring of different branches in a mind map encode further information about the observed topic. Mind maps have been used in many fashions, e.g., for brainstorming, teaching, interactive presentations and so on. In a study conducted by Nesbit et al., mind maps were found to be useful and more effective than summaries or essays [26]. Mind mapping has also been successfully applied in classroom environments [8]. We observed that traditionally annotating on paper, which is used for close reading, resembles the mind mapping process. In the close reading process, the observed text is the main theme and annotations act as ideas, facts and observations about certain fragments of the analyzed text. In the case





Seems to be thinking about a fantasy from past. May be has fear from animals (dogs, crow etc)??



The first objects that assume a distinct presence before me, as I look far back, into the blank of my infancy, are my mother with her pretty hair and youthful shape, and Peggotty with no shape at all , and eyes so dark that they seemed to darken their whole neighbourhood in her face, and cheeks and arms so hard and red that I wondered the birds didn't peck her in preference to apples.

I believe I can remember these two at a little distance apart, dwarfed to my sight by stooping down or kneeling on the floor, and I going unsteadily from the one to the other. I have an impression on my mind which I cannot distinguish from actual remembrance, of the touch of Peggotty's forefinger as she used to hold it out to me, and of its being roughened by needlework, like a pocket nutmeg-grater.

This may be fancy , though I think the memory of most of us can go farther back into such times than many of us suppose ; just as I believe the power of observation in numbers of very young children to be quite wonderful for its closeness and accuracy. Indeed, I think that most grown men who are remarkable in this respect , may with greater propriety be said not to have lost the faculty , than to have acquired it ; the rather , as I generally observe such men to retain a certain freshness , and gentleness , and capacity of being pleased , which are also an inheritance they have preserved from their **childroon**.

I might have a misgiving that I am 'meandering' in stopping to say this, but that it brings me to remark that I build these conclusions, in part upon my own experience of myself; and if it should appear from anything I may set down in this narrative that I was a child of close observation, or that as a man I have a strong memory of my childhood, I undoubtedly lay claim to both of these characteristics.

Looking back, as I was saying, into the blank of my infancy, the first objects I can remember as standing out by themselves from a confusion of things, are my mother and Peggotty. What else do I remember? Let me see.

There comes out of the cloud , our house – not new to me , but quite familiar , in its earliest remembrance. On the ground-floor is Peggotty's kitchen ; opening into a back yard ; with a pigeonhouse on a pole , in the centre ; without any pigeons in it ; a great dog-kennel in a corner ; without any dog ; and a quantity of fowls that look terribly tall to me ; walking about , in a menacing and ferocious manner. There is one cock who gets upon a post to crow , and seems to take particular notice of me as I look at him through the kitchen window ; who makes me shiver ; he is so flerce. Of the geese outside the side-gate who come waldling after me with their long necks stretched out when I go that way ! I dream at night ; as a man environed by wild beasts might dream of lions:

Here is a long passage – what an enormous perspective I make of It ! – leading from Peggotty's kitchen to the front door. A dark store-room opens out of it , and that is a place to be run past at inght ; for I dour know what may be among those tubs and jars and old teac-hest , when there is nobody in there with a dimly-burning light , letting a mouldy air come out of the door , in which there is the smell of soap , pickles, pepper, candles, and coffee, all at one whilf. Then there are the two parlours : the parlour in which we sit of an evening , my mother and I and Peggotty – for Peggotty had use our companion , when her work is done and we are alone – and the best parlour where we sit on a Sunday ; grandly , but not so comfortably. There is something of a doleful air work is done and we are alone - and the best parlour where we sit on a Sunday ; grandly , but not so comfortably. There is something of a doleful air mother rads to Peggotty had the – I dont Know when, but aparently ages ago – about my father's funeral, and the company having their black cloaks put on. One Sunday night my mother rads to Peggotty and me in there, how Lazarus was raised up from the dead. And I am so frightened that they are afterwards obliged to take me out of bed , and show me the quiet churchyard out of the bedroom window, with the dead all lying in their graves at rest , below the solemn moon.

There is nothing half so green that I know anywhere, a: the grass of that churchyard ; nothing half so shady as its trees ; nothing half so quiet as its tombs ones. The sheep are feeding there, when I kneel up, early in the morning, in my little bed in a clocet within my mother's room, to look out at it ; and I see the red light shining on the sun-dial, and think within myself, Is the sun-dial glad, I wonder, that it can tell the time again?

Here is our pew in the church. What a high-backed pew ! With a window near it , out of which our house can be seen , and IS seen many times during the morning's service , by Peggotty', who likes to make herself as sure as she can that it's not being robbed, or is not in flames. But though Peggotty's eye wanders , she is much offended if mine does , and frowns to me , as I stand upon the sear , that I am to look at the clergyman. But I can't always look at him – I know him without that white thing on , and I am afraid of his wondering why I stare so , and perhaps stopping the service to inquire – and what am I to do? It's a dreadful thing to gape , but I must do something. I look at my mother , but she pretends not to see me. I look at a boy in the aisle, and he makes faces at me. I look at at be sunlight coming in at the open door through the porch , and there I see a stray sheep – I don't mean a sinner , but metton – half making up his mind to come into the church. I feel that if I looked at him any longer , I might be tempted to say something out loud ; and what would become of me then ! look up at the monumental tables on the wall , and try to think of Mr. Bodgers late of this parish , and what the feelings of Mrs. Bodgers must have been , when affliction sore , long time Mr. Bodgers bore , and physicians were in vain. I wonder whether they called in Mr. Chillip , and he cashe it would make , with another boy coming up the stairs to attack it , and having the velvet cushion with the tassels thrown down on his head. In time my eyes gradually shut up ; and , from seeming to hear the clergyman singing a drowsy song in the heat , I hear nothing , until f fall off the seat with a crash , and am taken out , more dead than ailve , by Peggotty. Are memory, observe and remember used in same context by the author? Let's analyze with TagPies!







Fig. 3. AnnotateVis screenshot: User close reading text snippet from David Copperfield

of common mind maps, the central node does not depict any meaning. Insofar, the mind map usage in a close reading process differs as the text in question conveys a lot of information. The prominent features of AnnotateVis are as follows:

Integrated environment AnnotateVis provides an integrated environment where the scholar can annotate and perform text analyses in multifarious ways. In addition to annotating text fragments as also provided by other web annotation tools, the scholar can additionally create annotations in the form of media such as audio, video and pictures, which support the scholars close reading process. Notably, the scholar can perform a number of text analyses using distant reading tools such as tag clouds, charts, maps, timelines etc. and place these annotations as interactive visualizations. All annotations are placed in the margins alongside the text.

Free layout Following the design strategy of mind maps, AnnotateVis provides a free layout for the placement of annotations. The scholar can decide the best suited position for an annotation according to its importance and its proximity to the text. As opposed to the traditional close reading, which results in a final setting of annotations, the margins alongside the digital text can be flexibly annotated, and the layout can be changed interactively.

Distant reading techniques AnnotateVis offers a multitude of distant reading tools. Thereby, the scholar can select an appropriate visualization technique in accordance to the observed text fragment and the research question at hand. This is an important feature as closed reading is a customizable process.

Annotation scope Another important feature of AnnotateVis is the ability of performing text analyses at various text hierarchy levels. Depending on the research question as well we the selected text analysis method, the scholar can select a text fragment to be examined, e.g., the current page, a paragraph, a book chapter, or the entire text.

Workflow integration As mentioned before, AnnotateVis is designed the way that it is easy for humanities scholars to integrate a close reading into their existing research workflows. The scholar can save the results and reload them for further analysis. This also provides the opportunity to share the individual close reading with other scholars, and supports the collaborative work essential for (digital) humanities scholars.

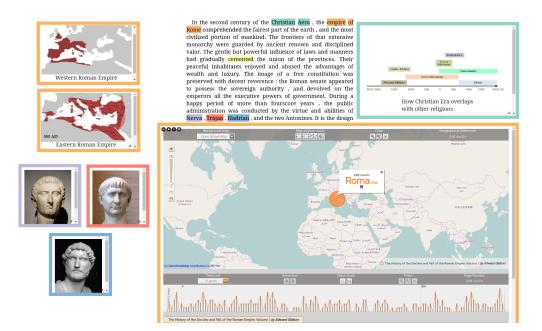


Fig. 4. AnnotateVis screenshot: User close reading text snippet from History of the decline and fall of the Roman Empire

4 USAGE SCENARIOS

In this section, we explain the capabilities of AnnotateVis with two usage scenarios. In Fig. 2, a text excerpt from Charles Dickens *David Copperfield* is close read by a humanities scholar. We see how the scholar annotated observations, assertions and assumptions in the close reading process. Fig. 3 shows the same portion of text being close read in AnnotateVis. The user selected text fragments annotated with additional information to the observed subject. The color of the annotated text and the borders of the annotation boxes are used as the visual identifiers for the user. Below, we list the users annotations of text fragments, which are shown in Fig. 3.

- In the top left we see a video annotation (light green), which embeds a YouTube source containing an audio recording of chapter 2.
- The user adds a map showing different places where David lived in his *childhood*. The annotation border and the term childhood in the text are marked in blue.
- In the traditional close reading scenario explained in Fig. 2, the scholar made the assumption if *memory* equals *observation*. In AnnotateVis, the user applied TagPies [16] to further investigate this assumption. As shown in the top right corner of Fig. 3 in purple, the user created three different TagPies for the terms memory, observe and remember. Their co-occurrences are compared on different text hierarchy levels: the currently analyzed chapter 2, a subset of chapters, and the entire book.
- The user selected a paragraph of the text, and annotated his interpretation in the form of digital text annotation (grey).
- To illustrate the phrase *here is our pew at a church*, the user annotates an image (marked in green) taken from a printed edition.
- On the right bottom left, the user annotated the term *Peggotty* in cyan color. Firstly, the user wrote his observations about Peggotty's character. Secondly, he put an image of Peggotty found in the web. Thirdly, the user added an interactive annotation in form of concordance plot to see how Peggotty was mentioned in the concerning chapter 2.

In the second scenario, the user close read a text fragment of Edward Gibbon's *History of the decline and fall of the Roman Empire*. A

screenshot of the close reading process in AnnotateVis is shown in Fig. 4. The user analyzed of the texts concept of the *Roman Empire*. At first, he added two maps of the Western and Eastern Roman Empire of envisage its temporal change of geographical dimension. Furthermore, the user analyzed the usage of the placename *Rome* in the book using GeoTemCo [19]. The time graph shows how the word Rome was used throughout the book. Usually, the interactive annotations are placed in a minimized view next to the text, but the user can also enlarge a view (map) for further analysis. Another annotation in light green (top right) shows a timeline that illustrates how the *Christian era* coincides with other religions. Finally, we see that user annotated images of Emperors *Nerva, Trajan* and *Hadrian*.

5 FEEDBACK

We discussed the AnnotateVis design and functionality with collaborating humanities scholars. They mentioned that the proposed design resembles the traditional close reading on paper, and that AnnotateVis will help humanities scholars to quickly adapt and integrate this digital close reading methodology into their existing workflows. This could help lower the fear of scholars in classical studies who are reluctant to use computers in their traditional workflows. We also presented the proposed design of AnnotateVis at the Digital Humanities conference 2016 [10] and discussed the design with various humanities scholars, who appreciated our novel close reading methodology, stating that there is a need for a close reading tool that supports distant reading visualizations. We also got positive feedback concerning the placement strategy of annotations. One of the scholars remarked that it would benefit them to group the annotations as they desire, instead of a tool forcing them to use a predefined layout.

6 FUTURE WORK

At the moment, AnnotateVis provides basic text analysis tasks supported by distant reading visualizations. In the future, we intend adding information extraction techniques such as Named Entity recognition, Relationship Extraction or Terminology extraction, so that the text analysis base can be broadened and more distant reading visualizations can be added to the existing toolbox to further facilitate the humanities scholars close reading experience. At the moment, the placement of annotations is user dependent. We plan to improve the layout strategy by suggesting an optimal position for an annotation. In addition, we intend to perform a user study to evaluate the utility of AnnotateVis to support scholars in close reading, and to spot necessary improvements.

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