Towards Hermeneutic Visualization in Digital Literary Studies

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Abstract

Hermeneutic approaches in the digital humanities have been agnostic about the epistemological premises of hermeneutic theory. These can be summarized as (1) differentiation author/text, (2) hermeneutic circle and (3) dependency text/recipient. In this article we present the concept of hermeneutic visualization as a means of bridging the gap between classic hermeneutic theory and the emerging practice of digital hermeneutics. Since data visualization is based on epistemological premises stemming from the sciences, it is not well-equipped to meet hermeneutic demands. We discuss four postulates that can be used as guidelines and help transform traditional data visualization into hermeneutic visualization, while respecting the epistemological foundations of hermeneutic theory. We demonstrate the usefulness of the postulates with an interactive prototype “Stereoscope” designed to support them.

1 Introduction

Data visualization has become a prolific method in digital literary studies to represent the results of a research process. While it is most commonly used to communicate these results to a scholarly audience, there is an increasing number of cases that exhibit an analytical use of the method in order to gain a better understanding of the textual data under investigation. However, most of the debate around visualization is concerned with the representation of text data automatically generated by algorithms. Traditional scholarship in literary studies, on the other hand, is primarily concerned with the interpretation of literary works in order to elucidate their meaning. Hermeneutics can be seen as the most established literary theory in this regard. Naturally, this has been recognized in the digital humanities as well and there has been some discussion on how the digital humanities might live up to expectations and methodological requirements associated with a digitally supported hermeneutic practice.
We can observe results that have arisen from these discussions in a number of software tools. These tools are replicating traditional scholarly activities that are considered a part of the interpretation process. Unsworth (2000) gives a systematic account of “scholarly primitives”, as he calls these activities, some of which are applied by scholars during the interpretative process.
Among these are annotation, comparison and representation. As for annotation, this is often the starting point of hermeneutic practice: highlighting parts of a document and writing down comments in the margins are two of the oldest scholarly techniques.

While the integration of these primary activities into digital tools certainly is a step towards hermeneutics in the digital realm (or *digital hermeneutics*), these efforts have been agnostic about the epistemological premises of hermeneutic theory, as we will argue in this article. These premises are:

1. The differentiation between intentions of author and text
2. The holistic premise (hermeneutic circle)

3 The dependency between text and recipient

Against this backdrop we believe that visualization might serve as the missing link between these fundamental hermeneutic premises and digital hermeneutics. Indeed, visualization is not only suitable to answer the premises, but it could even exceed what is possible in the analog context and offer new modes of analysis and interpretation.

At the same time, we are skeptical of the aptitude of common data visualization approaches for this task. Since data visualization has its origin in science, it is oriented towards the representation of objective facts, which are "observer-independent" (Drucker 2011). A common definition for data visualization is:

> The use of computer-supported, interactive, visual representations of abstract data to amplify cognition (Card et al. 1999).

In hermeneutics, on the other hand, scholars are dealing with subjective, ambiguous and constructed data, for which conventional data visualization is not adequate. With respect to this, we suggest to extend the above definition so that it may also account for the visualization of hermeneutic data. We define hermeneutic visualization as:

> The use of computer-supported, interactive, visual representations of text annotations to manipulate, reconfigure and explore them in order to create visual interpretations that can be used as arguments and allow a critical reflection of the hermeneutic process in light of a research question.

The obvious questions that pose itself to us in this context are: What do hermeneutic visualizations look like? How do we create them?

In answering these questions, our conceptual starting point are four postulates for hermeneutic visualizations: *Two Way Screen, Quality, Parallax* and *Discourse* (cf. Meister et al. 2017; Drucker 2018). These four postulates serve as guidelines for creating hermeneutic visualizations and embedding them in user interfaces, and we will demonstrate their usefulness with the help of the interactive visualization prototype "Stereoscope" based on these postulates.

Here is the structure of our argument: In part *2,* we will begin with a definition of terms in literary studies relevant to our research (2.1). This will be followed by a short synopsis of the development of classic hermeneutics and an exposition and explanation of the three epistemological premises (2.2). The following section (2.3) will outline the most important works regarding digital hermeneutics and show how scholarly interpretative activities are reflected in these to date. Finally, the section 2.4 will discuss how visualizations are well-suited to represent these activities, but also lacking qualities in order to meet the epistemological premises. Part *3,* will address these lacking qualities by discussing four postulates. In part *4,* we will then demonstrate how these postulates have been addressed in a software prototype. The article will close with a conclusion (part 5).

2 From the hermeneutic foundation to digital hermeneutic visualizations

In this part, we will turn our attention to the hermeneutic tradition and investigate what digital hermeneutics have been concerned with so far and in what way they fall short of epistemological premises of classic hermeneutics. We will examine general qualities of visualizations and look at examples of how visualizations are already used for interpretative activities, but have to be further adjusted to correspond to the epistemological premises of hermeneutics in order to be beneficial for digital hermeneutics.

2.1 Interpretation, Method, and Argument in Literary Studies

Interpretation is considered one of the main activities of literary studies (cf. Albrecht et al. 2015, 1).[1] The term *interpretation*, a derivation from the Latin word "*interpretatio*: understand, explain, translate" (Winko 2000, 169), is defined as

> "the formulation of hypotheses about aspects of meaning in literary texts. These hypotheses regarding 'meaning' are generated by reasoning processes that apply inference rules […]" (Gius et al. 2017, 236).

Despite the idea of a reasoning process that does not require any principles or the claim of some literary scholars "that literary texts are ambiguous or 'polyvalent' by nature", as Gius and Jacke (2017, 234) point out, a literary interpretation is based on rules (cf. Jannidis et al. 2003, 6). Thus, the literary use of the term cannot be equated with the common term interpretation, which does not include rules. These rules, which are applied in a reasoning process, can be provided by different theoretical approaches (cf. Winko 2000, 169).

A literary theory can be defined as an "explicit, elaborated, logical structured system of categories in order to describe, explore or explain certain issues" (Nünning et al. 2010, 6). Literary theories, however, provide not only specific epistemological implications regarding, for example, the concept of authorship, but also contain an implicit idea of meaning. During decades of theoretical debates and throughout the different turns, the parameters indicating or representing meaning have shifted (cf. Jannidis et al. 2003, 7). Besides the epistemological implications, this also changed the definition of what actually constitutes a research object as such. According to Heisenberg's claim of the observer dependency of an object (known as the *uncertainty principle*), the inference rules of an interpretative framework restructure the object under investigation (Heisenberg 1928, 26).

Methods, on the other hand, differ from theories. A literary method is a procedure for accomplishing knowledge in a research inquiry. Methods can be characterized as purposeful and rule-based (cf. Nünning et al. 2010, 8; Winko 2000, 581). Therefore, a theory could not only encompass one or a set of several methods, but also demand the application of methods with varying degrees of specification (for example deductive or dialectical methods compared to the more general operations such as reading or generating hypotheses).

Argumentation is described as the "unfolding of given proofs" by Cicero in *De partitione Oratoria* (cf. Rädle 2000, 130). In literary studies, argumentation plays an important role for

[1] The selected terms *interpretation, methods, argumentation* can be seen as an attempt to conceptualize main parts of the literary studies framework. However, we do not assume that these terms fully cover the literary work. Furthermore, we acknowledge that the chosen terms overlap with terms for example like *heuristic, technique, practice*.

the process of generating and validating interpretations (cf. Albrecht et al. 2015, 12). Argumentation can be described as a formal or logical organization of single observations, that serve as arguments "to provide evidence in favour of some point of view" (Groarke 2016). With respect to interpretation, an argumentation explicates the interpretative process in a textual or visual form by structuring, connecting, and subsuming single observations. Kindt and Schmidt (1976, 9) mention three attributes for the evaluation of an argumentation: rigor, intersubjectivity, validation. Recent research criticizes not only the nonreflective understanding of argumentation, but also remarks the lack of research about literary arguments and argumentation. One issue, for example, is the idea of evidence and validation. How can we verify a literary hypothesis? Is it acceptable for a hypothesis to resist falsification, or does it need to be positively confirmed via case studies? (cf. Albrecht et al. 2015, 13).

2.2 Foundations of hermeneutics

The term *hermeneutics* covers two concepts: One, it is determined as a philological theory or methodology of reading, understanding and interpretation (of texts). Moreover, hermeneutics in this sense is understood as a specific method, which aims to identify the specific meaning or significance of a text. This has led to a semantic fuzziness oscillating between theory and method as well as practice. Two, hermeneutics is also understood as a philosophical orientation focusing on the ontological phenomenon of understanding (cf. Weimar 2000, 25). Especially, Martin Heidegger shaped this strand of the hermeneutic tradition (cf. Heidegger 1923). For our area of research the first definition is decisive.

Köppe and Winko (2013, 19) point out that the hermeneutic approach is a "precursor" theory, which is not represented anymore. But according to introductions into literary studies, the hermeneutic theory is not only still widespread, it is also mentioned first before all other theories (cf. Jeßing et al. 2012, 276; Nünning et al. 2010, 29; Jahraus et al. 2002, 36). The hermeneutic theory and its long tradition seem to represent an essential understanding of text interpretation. In this article, we will attempt to derive fundamental premises and assumptions from the hermeneutic theory.

Essential for the hermeneutic theory is the idea of an understanding, which aims to reach a deeper meaning or hidden reason of a text. Consequently, it is assumed that (literary) texts have a meaning, which can be exposed under certain conditions. This meaning does not have an objective, but rather an observer-dependant and contextual status. In that regard, the hermeneutic approach differs widely, for example, from Derrida's deconstruction (cf. Derrida 1967).

In his work *Hermeneutik und Kritik mit besonderer Beziehung auf das Neue Testament* (1838) Friedrich Schleiermacher (1768–1834) stresses two important epistemological premises of the hermeneutic understanding of meaning. First, Schleiermacher differentiates between the intentions of the author and the expressions in the text. Schleiermacher's distinction leads to the idea of an autonomous intention of the text, which is not congruent with the intention of the author. Thus, the text is regarded as an artificial and aesthetic work of art with a specific meaning (cf. Selbmann 2002, 38).

Second, Schleiermacher argues that a truly understanding of the text corresponds with the holistic dependency of parts and the whole. He proposes the "Grundsatz der Ganzheit" : "[T]he same way that the whole is, of course, understood in reference to the individual, so

too, the individual can only be understood in reference to the whole" (cf. [Schleiermacher], Mantzavinos 2016).

Moreover, the philologist Friedrich Ast (1778–1841) and later Schleiermacher emphasize the circular procedure of interpretation, i.e., the hermeneutic circle. In literary studies, the hermeneutic circle or spiral is regarded as an instrument for the formulation of a hypothesis connecting a meaningful whole and its elements (cf. O'Toole 2018). "Textual understanding", as Gius and Jacke (2017, 236) describe it, "is attained in the interplay between (contextual) assumptions about the text on the one hand, and textual data on the other hand […]." Thus, the act of interpretation constitutes a specific practice of a "reading and questioning […], back and forth, shifting the focus of one's attention and revising interim interpretations and judgements along the way" (Chamber et al. 2006, 35).[2]

Another premise of the hermeneutic method – besides the differentiation between author and text intention and the holistic premise – is the highly valued co-dependency between the text and the recipient. The co-dependency is linked to the issue of context and subjective or social perceptions and views. According to Hans-Georg Gadamer's *fusion of horizons*, a recipient, who engages with the text in a productive way, generates partial and subjective knowledge. This generated knowledge in the form of meaning "can neither be deduced theoretically, nor be fully articulated, but rests on a kind of tact or sensitivity that is only exhibited in the form of exemplary judgments and interpretations" (Ramberg et al. 2010). Gius and Jacke (2017, 234) explain: "Because these reasoning processes are non-deductive, i.e., they are not strictly based on rules of deductive logic, they may result in more than one account of meaning."

Summing it up, it is notable first that the term hermeneutics covers different meanings, which could be summarized in the constructed dichotomies of theory and praxis/method as well as epistemology and ontology. In our research context we understand hermeneutics as a specific approach to reconstruct meaning through an iterative, relatively indeterminate and value-laden procedure. Essential for this approach are three premises, as explicated in the previous paragraphs:

1 The differentiation between intentions of author and text
2 The holistic premise (hermeneutic circle)
3 The dependency between text and recipient

The hermeneutic approach is one possibility to tackle the complexity of text comprehension. Further research could investigate visualization in other literary interpretative processes based on Derrida's idea of deconstruction or Foucauldian parameters of discourse, for example.

2.3 Conceptions of digital hermeneutics/interpretation

So far, hermeneutics, as understood in literary studies based on the three premises mentioned in the previous section, has not played a prominent role in digital humanities. As Zundert (2016, 335) states:

[2] Problems and critics of the hermeneutic circle cf. Danneberg (1995).

> "The dialogue surrounding hermeneutics seems not to have developed fully yet in digital humanities — references to hermeneutics are scant and often at a concrete level of the practice of text interpretation, such as when Katherine Hayles (2012) uses the phrase 'hermeneutic close reading'. Yet from several paragraphs and sections in the literature the emergence of a debate seems traceable."

Literary scholars participating in this debate on hermeneutics in digital humanities or *digital hermeneutics,* as it is often called, have different views on how digital technology and the use of it might shape traditional hermeneutics and what digital hermeneutics should encompass. Generally speaking, the debate is dominated by attempts to digitally replicate interpretative processes known from the analog world. However, a systematic effort to reflect on how the hermeneutic premises might be answered by digital technology is still missing.
Commonly, approaches toward a digital hermeneutics, or more generally toward interpretation, share the notion that it involves a process of "reconfiguration, reorganization or restructuring" (Armaselu et al. 2017), or as Samuels and McGann (1999) describe it, "deformance". Rockwell (2003, 213) calls the results of algorithmic analysis of texts hybrid texts" that operate as "interpretive aids":

> "[...] they are generated by processes of taking information apart and putting it back together into new configurations for the purposes of discovery and reflection."

This reconfiguration can be carried out automatically by an algorithm, as is the case, for example, in concordances, or by manual annotations and comments of text passages by scholars (cf. Rapp 2017; Jacke 2018). While the former is idiosyncratic to the digital realm, the latter has been practiced in traditional hermeneutics for a long time. In terms of possibilities to reconfigure and restructure, however, the digital world grants considerably more freedom than analog annotations. Bradley (2008, 266) describes a scholarly software prototype called *Pliny* that is guided by scholarly practice of interpretation in the analog world:

> "Notetaking, and this kind of juggling of notes to discover previously unrecognised patterns and relationships and to stimulate new ideas is one of the long established methods of scholarship."

Pliny allows scholars to annotate texts, images and other media by creating digital notes that can be arranged to one's' likings on a plane. Relationships between notes can be conveyed by placing them in spatial proximity or by nesting notes to account for hierarchical relationships. In contrast to the analog environment, notes can be reused in different structures and contexts as they are references, not actual objects. References between all the notes can be visualized in a special graph view.
Boot (2009) takes up Bradley's tripartition of the scholarly process into "Reading and Annotation (Resource)", "Developing Interpretation" and "Presentation of Interpretation (Article/Argument)" and describes the structure of annotations as "mesotext" that is made out of "mesodata" (individual annotations). *Mesotext* acts as a connector between the primary text (which it references) and "secondary texts" or "narratives" (the article a scholar is working on), for which it provides arguments. Similar to Pliny, allowing users to adjust the *mesotext* structure, when new insights have been gained, the concept comes close to the traditional analog annotation process.

As a clear differentiation to the scientific method and a way of strengthening the hermeneutic approach, some scholars argue for exploration or a "hermeneutic of play" (Rockwell 2003, 214). Zundert (2016, 335) calls for a usage of data not so much as evidence in the scientific sense, but rather as a resource to "provoke new questions and explorations" that can be utilized in a "playful iterative approach". Ramsay (2007) even speaks of a "Screwmeneutical Imperative" that scholars should follow, an obligation to screw around and try out things.

2.4 Towards hermeneutic visualizations

The possibility to reconfigure texts is a common trait that all approaches and reflections regarding digital hermeneutics share. Here, visualization could assume the role of an affordance (cf. Gibson 2014), inviting users not only to inspect the configuration, but also in the course of exploration to change it. With its ability to create overviews of data structures, reduced sizes for representation, the possibility to explore annotations by interacting with the visualization (cf. Seifert 2014), the ability to uncover patterns in the data that were not or were hardly recognizable in the annotation view (cf. Card et al. 1999), and the ability to quickly compare different structures, visualization seems to be the perfect mediator between the current configuration and possible reconfigurations.

We can thus consider the arrangement of annotations a representation of a reconfiguration based on an interpretation. Each visualization would then create and represent another arrangement of annotations, i.e., another reconfiguration, and with that an interpretation. Kath et al. (2015) have already brought to attention the need for a second order hermeneutics, termed *New Visual Hermeneutics,* which can guide the interpretation of such visualizations. In a similar vein Rockwell also sees visualization tools as behaving "like hermeneutical theories" (Ramsay and Rockwell 2012) that offer new perspectives on the research object.

Traditionally, visualizations have been developed and used in scientific contexts. Drucker (2011) points out that "realist models of knowledge" have been instrumental in forming these representations and that "we need to take on the challenge of developing graphical expressions rooted in and appropriate to interpretative activity." Revisiting the premises here, one will see that it poses a challenge to represent things like partialness, ambiguity, and uncertainty with common forms of visualization.

Since "knowledge is constructed", rather than "given as a natural representation of pre-existing fact" (Drucker 2011), in the humanities (and to a certain degree this is true for the sciences as well) there is room to explore, speculate, and experiment. Information visualization's outstanding ability to support exploration, makes it an ideal candidate to enable playing around and experimenting with annotations. Seifert et al. (2014, 190) speak of visualization as "an effective enabler for exploratory analysis, making it a powerful tool for gaining insight into unexplored data sets."

Along these lines, Hinrichs and Forlini (2017) advocate the use of visualization as "sandcastles", which they describe as "tailored, unique, often stunning yet also transient and unstable interactive visualizations". In contrast to a conception of visualization as tools, the authors elaborate, they "elicit critical insights, interpretation, speculation and discussions within and beyond scholarly audiences."

While Galey and Ruecker (2010) do not refer to visualizations in particular (although they use visualizations as case studies for their argument), they argue for the use of digital artifacts as arguments:

> "The digital humanities must not lose sight of the design of artifacts as a critical act, one that may reflect insights into materials and advance an argument about an artifact's role in the world. Our purpose here is to follow the implications of a hermeneutical approach to design for digital humanities projects that entail the strategic prototyping of digital artifacts."

However, as Rockwell and Ramsay (2012) convincingly point out, Galey and Ruecker's concept of argument refers rather to the interface of the digital artifact than to the contents of the text which is supposed to be analyzed with the digital tool.
Referring to our earlier comment on argumentation in the context of literary studies as a formal or logical organisation of single observations that serve as arguments "to provide evidence in favour of some point of view" (Groarke 2016), we should consider visualizations as another non-linear form of argument that complements textual explications in an argumentation.

Building on these discussions, we advocate for a confident appropriation of visualization as part of the hermeneutic scholarly practice, while acknowledging that current visualization techniques often fall short of fulfilling or even contradict the mentioned premises of a hermeneutic process. Thus, following these premises, we will lay out the conditions, under which visualizations can be beneficial for the hermeneutic process in the digital realm and act as hermeneutic visualizations that allow for reconfigurations and explorations and can be used as building blocks for an argument. For this, we will propose the four aforementioned postulates that help in creating and embedding such visualizations into a user interface[3].

3 Hermeneutic Visualization: Four Postulates

As we have seen, one issue of the current approaches to digital hermeneutics is the disregard of the epistemological premises of hermeneutics, i.e., the differentiation between intention of author and text, the holistic idea of the understanding of the whole and its parts (circularity of the interpretation process), as well as the dependency between the text and the recipient (subjective and context-dependent reasoning process). While the approaches towards digital hermeneutics like reconfiguration, exploration or argumentation might be inspired by interpretative activities and hermeneutic thinking, so far, there has not been any attempt to investigate how hermeneutic premises might be systematically incorporated in the digital realm.
Thus, we argue that the potential of digital hermeneutics has not been fully exploited and that visualizations are the missing link between the hermeneutic premises and digital hermeneutics.

[3] In our understanding hermeneutic visualizations have to be developed with respect to the user interface that is holding these visualizations. To be able to reconfigure, explore and form arguments with hermeneutic visualizations there has to be a user interface surrounding these visualizations that is oriented towards the hermeneutic process as a whole and allows the manipulation of the visualizations as well as the arrangement of them.

In order for visualizations to fulfill this role, we need to take a look at common forms of visualization and either adjust them to meet the premises or, when necessary, come up with completely new forms. To simplify this process, the following four postulates can serve as guidelines: *Two Way Screen, Quality, Parallax and Discourse.*
We understand these postulates as transformers of and mediators between the theoretical hermeneutic model and the concrete visual arrangement. Furthermore, we will demonstrate how the postulates can be seen to address the discrepancy between literary and digital hermeneutics. While the first premise of differentiation between author intention and text intention is an essential foundation for approaching literature in a non-positivist manner, and with that allowing multiple interpretations is a general presupposition here, the application of the other two premises will be explicated for each individual postulate.

The postulate of the *Two Way Screen* refers to the interface, which should not be restricted to rendering, but allow manipulation as well. More precisely, a commitment to the *Two Way Screen* implies that the screen serves as a graphical and visual environment in which interpretation (ranging from low-level annotation and structuring to high-level theorizing activity) takes place, not only gets displayed (cf. Drucker 2018, 252).
The structure of the interface does not serve as a mere representation space for an interpretative result. Rather, the interface provides incentives to engage and to change bidirectionally between the representation of text data and the modelling of text data. This means that actions taken by changing any graphical feature as an act of interpretation are registered as new data and/or as changes in the data model on the fly. The underlying principle is to get away from the flat screen as a space of display by acknowledging the additional dimension of interpretative activity (cf. Drucker 2016). The postulate of the *Two Way Screen* is based on the holistic premise, as it allows a continuous shift between exploring the visualization to learn something about the text (the whole) and applying that new knowledge to change text data (the part), in consequence, creating new representations. Here, as well as in the postulate of *Quality,* the constructedness of the data becomes apparent and we can grasp it “as capta, taken and constructed” (Drucker 2011).

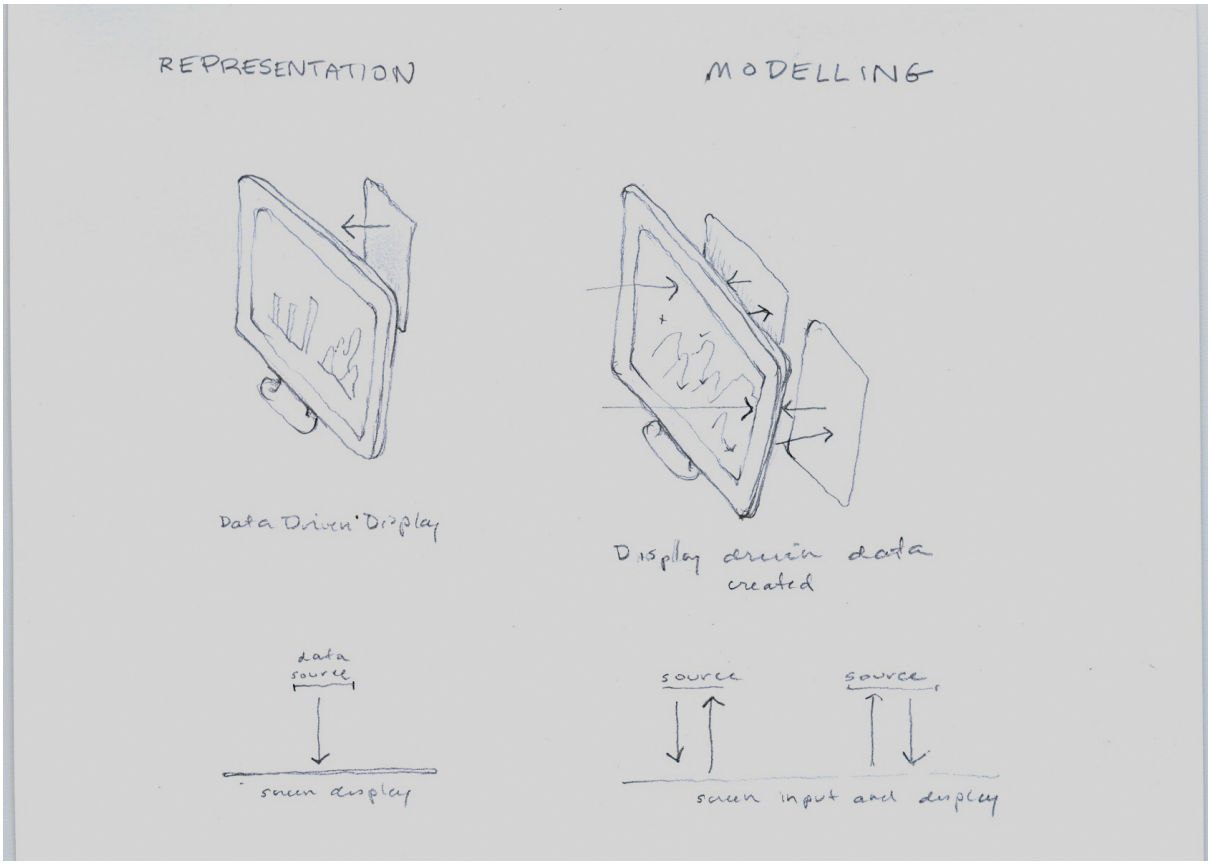

Fig. 1: Drucker (2016): Conception of the Two-Way-Screen (draft originated in the 3DH project)

While the postulate of the *Two Way Screen* formulates the necessity of providing means for changing and constructing interpretative data through the visualization, it does not specify how the data might be visually represented. To this end, the postulate of *Quality* demands the incorporation of the epistemological qualities of hermeneutic practice into the visualization. Responding to the hermeneutic premise of the dependency between text and recipient, *Quality* takes into account the subjective and contextual quality of the data by showing the annotated text data as *capta*.
We suggest an extension of the use of Jacques Bertin's visual variables (position, color, tone, size, shape etc.) (cf. Bertin 1983) to the encoding of *capta,* allowing literary scholars to express interpretative dimensions like salience or relatedness (cf. Drucker 2018, 249).

The third postulate of *Parallax* stresses the importance of providing multiple views on the object of hermeneutic inquiry (cf. Drucker 2018, 260). The term "parallax" "(Greek παράλλαξις (parallaxis)), meaning 'alternation'" (cf. English Oxford Dictionary) is a metaphorized *terminus technicus* of optics. We understand *Parallax* as visual multiperspectivity or multiple points of view, that reveal the ambiguity of a text. Ambiguity, as Berndt (2009, 122) points out, "denotes a fundamental 'equivocalness' that engenders 'uncertainty' and 'doubt'." The visualization in its parallax function, hence, provokes an ambiguity of a maybe "assumed" certainty or evidence. This provocation generated by the visualization relates to the premise of dependency between text and recipient once more and puts the situatedness and partialness of the hermeneutic reasoning process into effect. Moreover, the ambiguity evokes and leads to a "questionability whose astonishment gives

cause to further research" (Mersch 2009, 111). Instead of limiting the points of view, the postulate of *Parallax* increases the possibility for contradiction in the reasoning process.

The last postulate *Discourse* defines the role of the visualization in the argumentation. Following Latour (1986), who claims that "the ways in which we represent our arguments changes the way in which we argue" (cf. Hinrichs; Forlini 2017), we think that a hermeneutic visualization fosters the critical reflection of the hermeneutic process itself. An argumentation comprised of text as well as visualizations as single observations differs from the mere textual form. The connection between visualization, annotations (the object of study) and textual arguments enables a complex, non-linear movement between these entities that does not restrict scholars to one possible reading, but allows a multitude of readings. Furthermore, the direct connection between annotations and visualizations creates a transparency of individual arguments that invites the author, as well as the audience to critically reflect the argumentation. In that way, it lives up to the evaluation criteria rigor, intersubjectivity and validation mentioned in 2.1 and leads to an iterative refinement of the argumentation and an oscillation between part and whole, addressing the holistic premise in that way.

The postulates describe four interrelated aspects, under which visualizations can be beneficial for the hermeneutic process in the digital realm and act as hermeneutic visualizations. In the next part, we would like to underpin their validity by presenting their exemplary application in an interface concept and its prototypical implementation.

4 The Four Postulates Used as Guidelines for Prototypical Implementation

Referring to Boot's (2009) model of *mesotext* as a particular configuration of annotations *(mesodata)* that relates to the primary text, as well as to the secondary text (an article for example), we incorporated a tripartite user interface in our concept. There is a text area on the left side holding the primary text a scholar is studying, a canvas in the middle that can represent different configurations of annotations of the text with different visualizations and a views area on the right side that allows a scholar to build arguments by saving different views of canvasses with tags and comments assigned to them (Fig. 2).
All these parts are connected with each other, so that interacting with one part of the interface, like for example a mousehover over an annotation in the text area, leads to a highlight of that annotation in the canvas area (or highlight of the visually represented annotation, respectively).
Our concept will be illustrated by screenshots of our web-based prototype *Stereoscope* that implements the most important features of the concept.

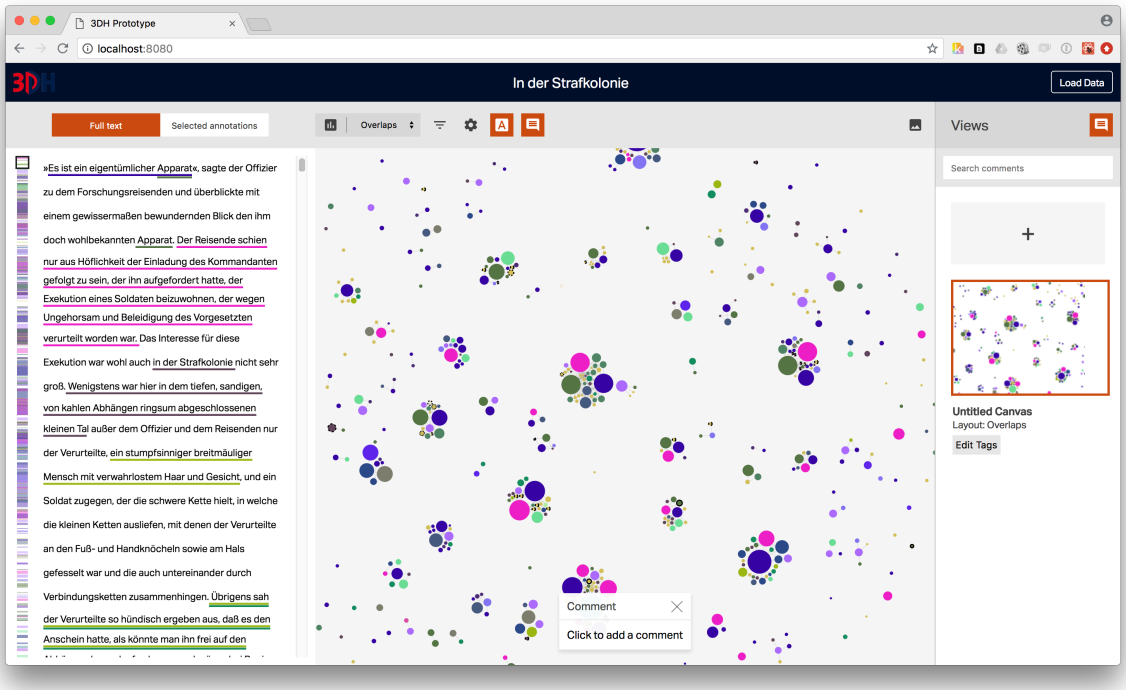

Fig. 2: User interface of the *Stereoscope* prototype with “overlays” layout selected

Text

The area on the left side shows the primary text a scholar is working on and the parts of the text that have already been annotated. Hovering over annotations produces a pop-up that informs about the categories of the annotations for the respective text passage. Annotations can be saved to a selection by clicking them. A toggle switch at the top of the text area allows scholars to switch between the linear text view and a view of the selected annotations.

The prototype allows to upload a text file together with an annotation file created by the software *CATMA*[4]. For practical purposes the prototype was developed to work with the CATMA format, however, a compatibility with other formats would be desirable.

Canvas

The canvas is the larger area in the middle of the interface that serves as a plane for creating configurations expressed through visualizations. Each visualization is comprised of circles of different sizes that represent annotations. We call these circles *glyphs.* Their size informs about the length of individual annotations. While the circles itself are immutable, the position of glyphs on the canvas can change depending on the visualization layout users have selected. Furthermore, different types of relationships between annotations can be expressed with connecting lines between glyphs. Currently, there is only one type of relationship that depicts the degree of textual proximity of text passages in the *overlaps* layout.

When hovering over a glyph a little pop-up reveals the type of annotation category. The category is also expressed by the color of the circle. Clicking on a glyph causes the text area to scroll to the corresponding annotated text passage. Analogous to the text area, alt-clicking

[4] http://catma.de/

on glyphs allows users to collect annotated text passages that can be viewed in the text area in the *selected annotations* mode (Fig. 3).

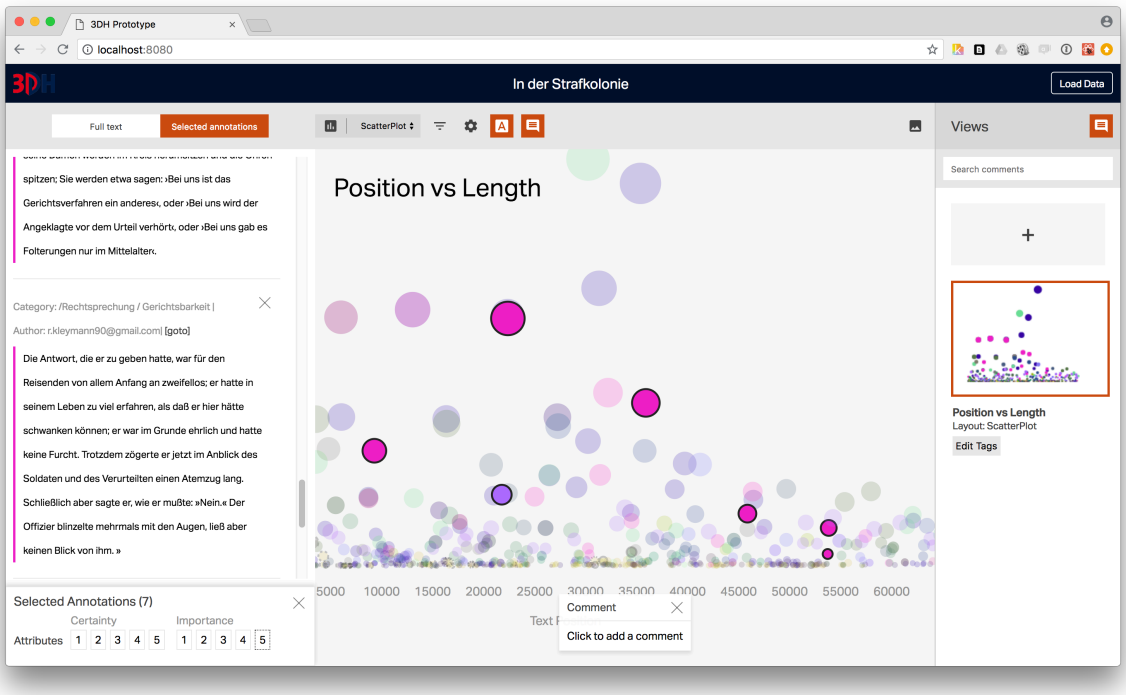

Fig. 3: *Selected annotations* mode: Collected annotations shown on the left and corresponding glyphs highlighted on the canvas

Using the scroll wheel of the mouse or a pinch gesture on the track pad visualizations can be zoomed in and out of and parts of the visualization can be moved into focus.
Above the canvas area different controls allow users to change the layout, show and hide panels and labels and export the current view as an image. We call the current state of the visualization on the canvas a “view”.
There are three togglable panels for filtering by annotation category, adding comments to a canvas view and adjusting settings for individual visualizations. When activated, these overlay the canvas in the bottom half (Fig. 4).
Users can currently select from three different types of visualizations: grid, scatterplot and overlaps (network diagram). These visualizations are integrated into the prototype as template files and the list can be extended to incorporate further visualization techniques. Scholars are encouraged to add new visualizations that are suited to their individual research questions and needs.

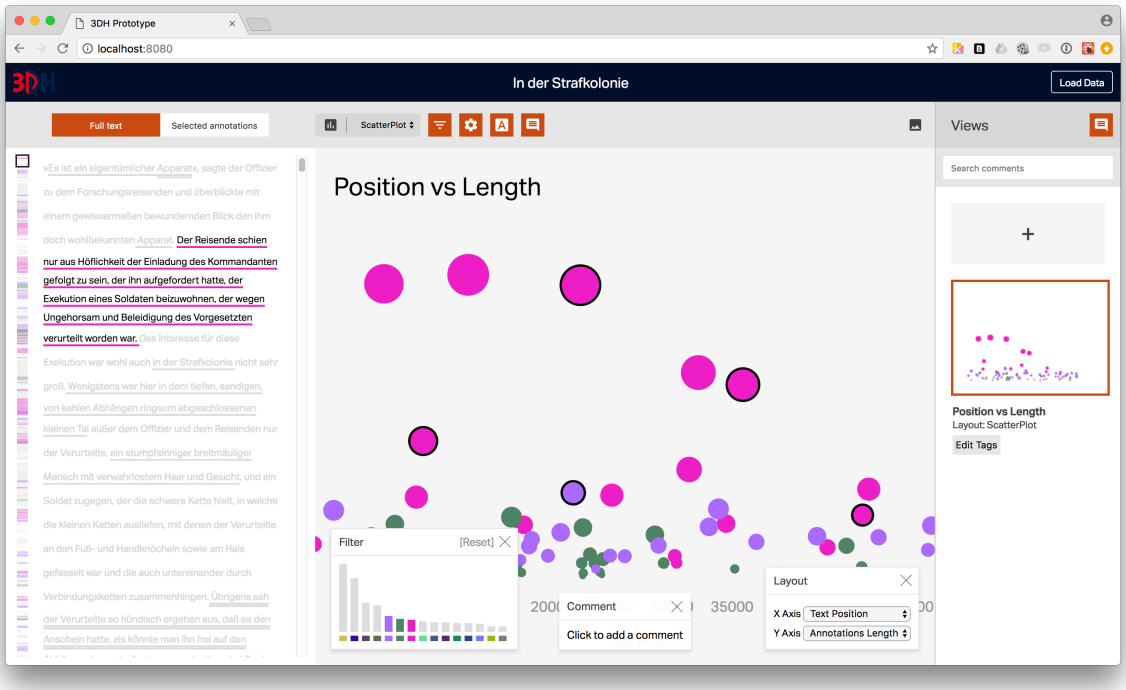

Fig. 4: Panels filter, comment and layout shown with three categories selected in the filter panel (Annotated text not falling under these categories is grayed out in the text area)

Views

The narrow column on the right side offers space for saving different views of the canvas as small thumbnails. Each view in this area consists of a miniature static image of the selected layout for the view, a title, the name of the layout, tags and a button to assign tags. If a comment has been written for a particular canvas, it is shown here as well. The currently selected view is marked by an orange border. All manipulations of the canvas, like selected filters or glyphs, adjusted settings or a change in zoom state are saved automatically for each view and are re-established, when users click on other canvasses to switch to them. Clicking the plus sign at the top opens a dialog window for adding a new view. Here, title, layout, and comment can be filled in.

All the comments assigned to the views can be searched with a search field at the top. Typing something in there automatically filters the list of views, fading out views that do not contain comments that match the search term.

If tags have been assigned to views, clicking on one of them filters the list with the respective tag. In that way, either ad-hoc search strings or tags can be used to create temporary subselections of the list. Individual views can also be exported as images.

Using the four postulates as guidelines for implementation

In this section, we will elaborate on the concrete development of a prototype using the four postulates. Naturally, this prototypical implementation is exemplary and not exhaustive. There are alternative ways of adhering to the postulates when developing a user interface. The usefulness for hermeneutic practice will become clear with the short examples we provide.

As described in the previous part, understanding annotations as *capta* rather than data, we accounted for this in the interface of the prototype with the possibility of assigning different

attribute values to selected annotations (or glyphs, respectively). This is exemplified with two attributes users can add: certainty and importance. Both attributes take values on a scale from 1 to 5. Setting these values changes the appearance of the glyphs and saves the changes in the underlying JSON format (see Fig. 5). The altered JSON file can be downloaded for each individual view (by clicking on the respective icon on the thumbnail image in the views area). This functionality provides an example of the postulate of the *Two-Way-Screen,* that could be extended to further functionality, like assigning other attributes or the change of categories, for example. Generally, when thinking about applying our concept to a full-fledged software tool, it would be desirable to integrate full annotation functionality into the system, while allowing the manipulation of annotation metadata via text as well as visualization.

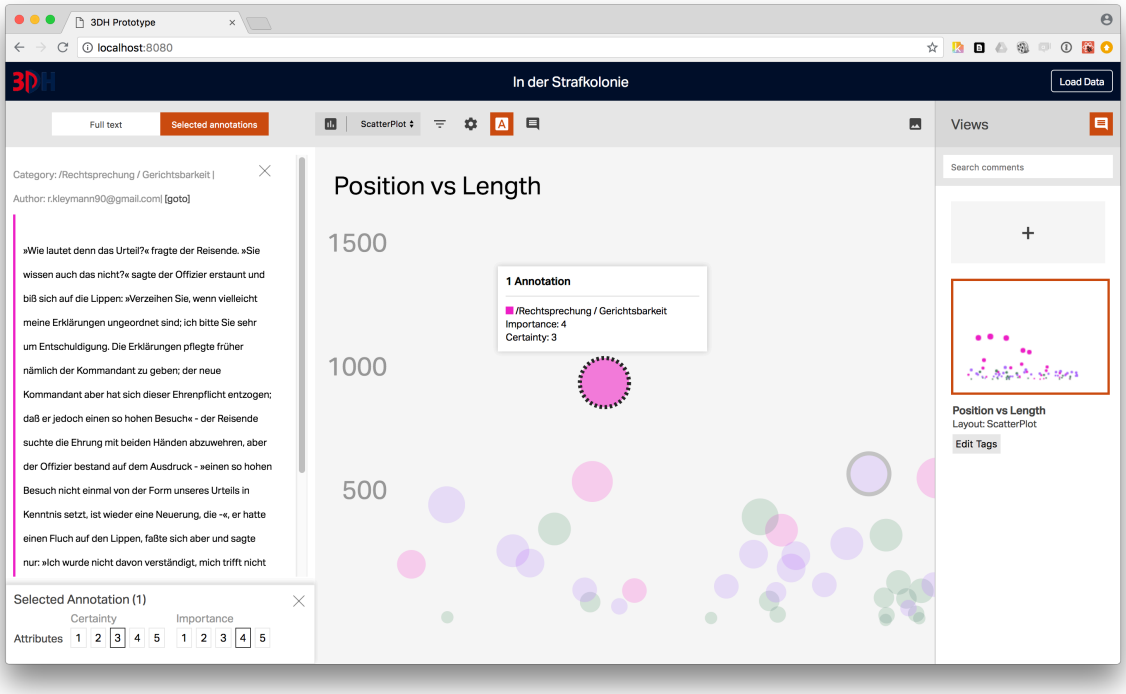

Fig. 5: Changing certainty and importance values changes the appearance of the glyphs and writes these changes to the JSON file

When assigning certainty or importance values scholars create a qualitative statement about the epistemic status of annotations, in that way addressing the *Qualitative* postulate. Qualitative statements are not restricted to the individual annotation, however. Adding comments and tags to views offers a way of making qualitative assessments about a particular configuration of annotations or collection of configurations, respectively (Fig. 6). In the prototype, visualizations are always based on an automatic structuring algorithm, be it the two scales of the scatterplot or the forces operating in the network layout. In addition to it, the interface concept also includes a functionality that allows scholars to define the spatial structures themselves, for example, by positioning glyphs freely on the canvas or allowing to group them by encircling them with lines drawn on the canvas. Interacting with the glyphs on the canvas in such a way could also be a way to offer meta annotations.

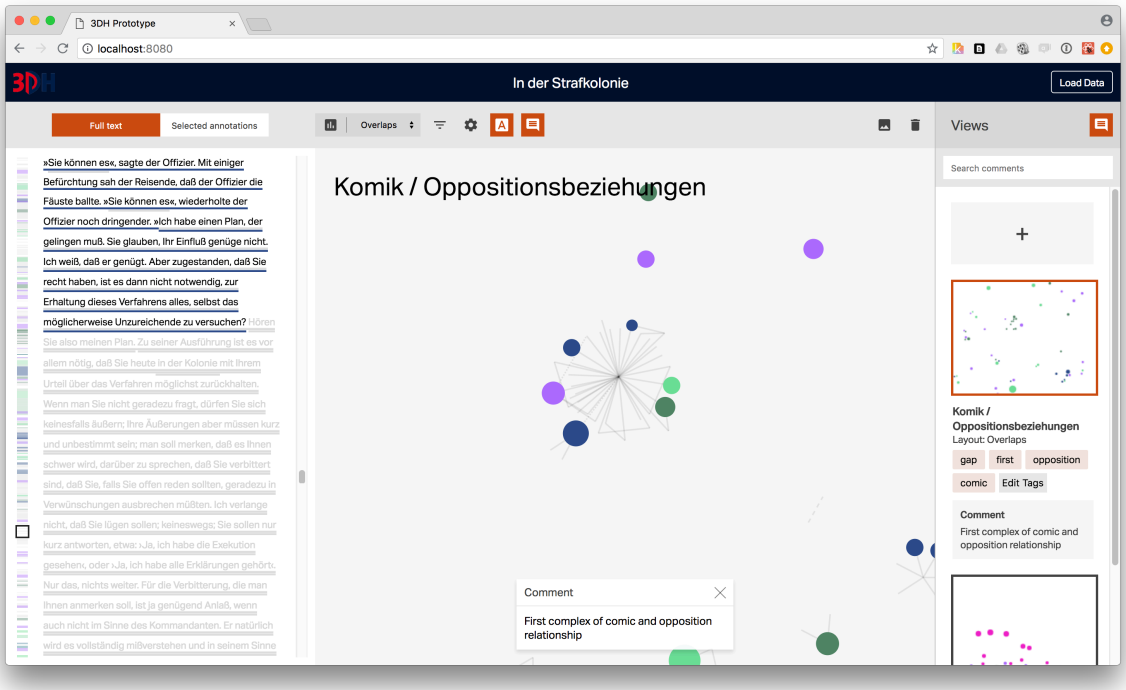

Fig. 6: Canvas with assigned comment and tags (Tags visible in the views area on the right side)

In the most basic way, the postulate of *Parallax* is accomplished by presenting annotations in the context of the surrounding text in a linear fashion side by side with the different non-linear configurations represented by the visualization layouts. Furthermore, with the views area on the right side of the prototype it becomes possible to compare different configurations with each other by switching between them. On another level, the ambiguity mentioned in the postulate is exemplified by the certainty attribute values assigned to glyphs. When looking at a particular visualization on the canvas, the filter and settings panel allow users to change the foundation for the representation, for example, by showing only certain categories of annotations in the visualization or to change parameters regarding the visualization layout (Fig. 7).

The views column on the right side of the interface responds to the *Discourse* postulate. Here, users are encouraged to build an argumentation out of visualizations (views) and texts (comments) as single observations.

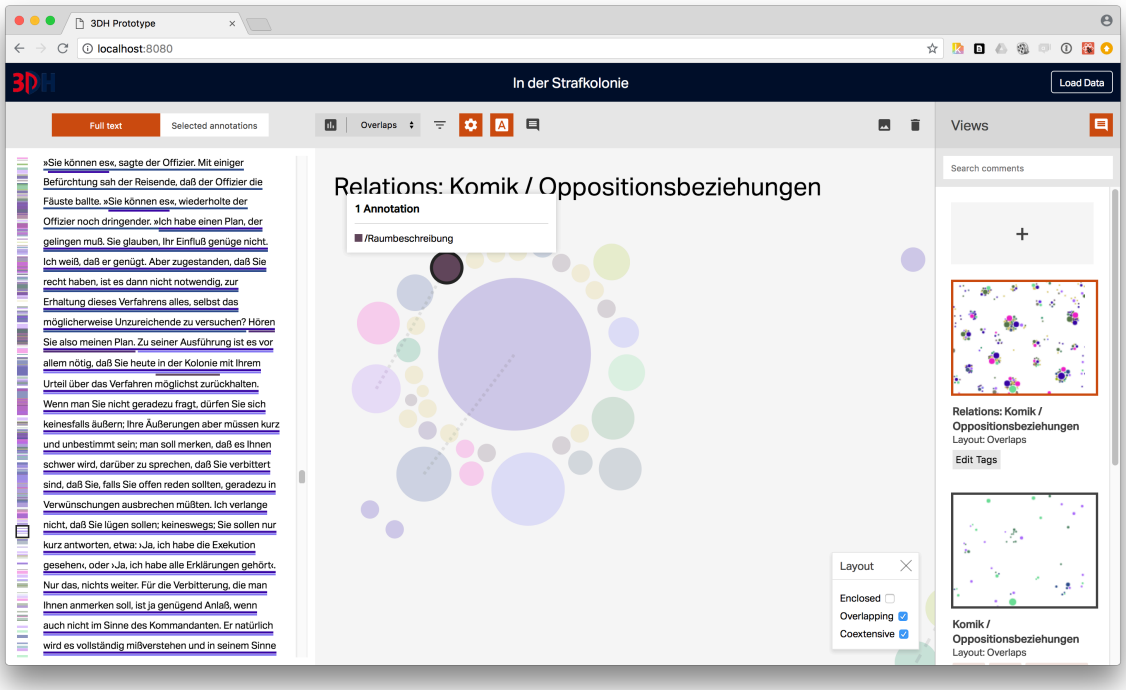

Fig. 7: “Enclosed” lines deselected in the settings panel (bottom right) for the overlaps layout

Tags assigned to views provide a structuring mechanism that can be used to form different argumentations out of the same views, thus presenting different possible readings to compare with each other.
Scholars can jump between views and, by clicking on them, in that manner read the argumentation in a non-linear way. By investigating individual views they can follow the argument down to the specific annotations in the text that constitute the foundation for the argument. This possibility to drill down creates a transparency in the argumentation that allows critical reflections on the rigor, intersubjectivity, and validation of the argumentation. Figure 8 shows the usage of several views for different argumentations.

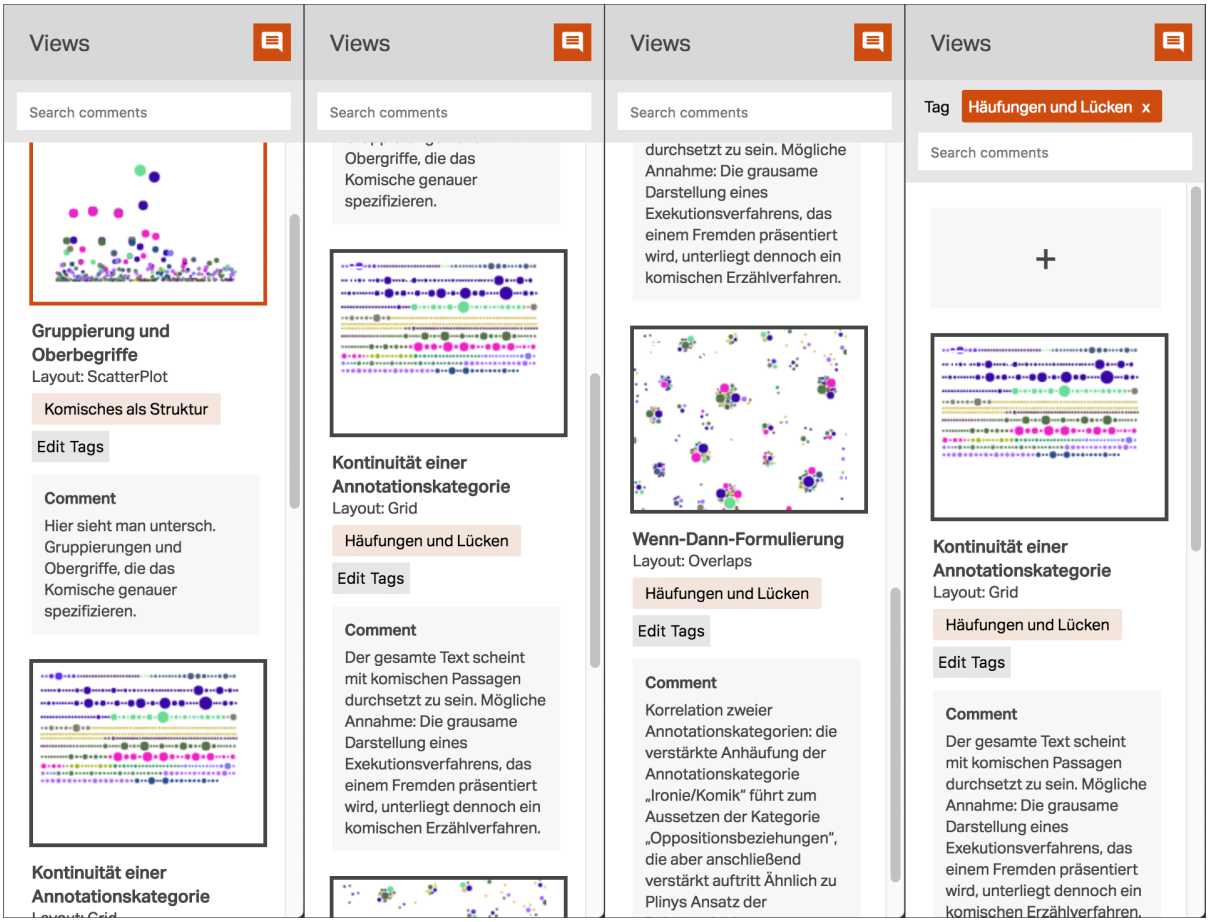

Fig. 8: A scholar scrolls through views belonging to two different argumentations (three leftmost images). In the right image the tag “Häufungen und Lücken” representing one of the two argumentations has been selected.

5 Conclusions and Future Work

In this article we presented four postulates as guidelines for developing hermeneutic visualizations. The resulting visualizations promote the connection of classic hermeneutics with digital approaches, since they address the epistemological premises of hermeneutics, as we have shown in our exemplary prototypical implementation guided by the postulates.

Looking at the hermeneutic visualizations in the prototype, one might notice that they have an appearance similar to traditional visualizations. This leads us back to the question formulated in the introduction: What do hermeneutic visualizations look like? In other words: Are we able to name distinctive qualities of hermeneutic visualizations?
The answer to this is to be found in the nature of hermeneutic theory expressed by the three premises and operationalized by the four postulates. While certainty and importance are typical examples of partial, contextual, and subjective knowledge and are expressed with the help of visual variables in the prototype, the central holistic premise demands an iterative, circular process of generating meaning and forming arguments that becomes visible in the structure of the user interface, but not primarily in individual visualizations.
Future implementations might put a stronger focus on the premise of the dependency between text and recipient (represented by the *Qualitative* and *Parallax* postulate), which might result in more examples of visual variables depicting partial, contextual and subjective

knowledge or even completely new visualizations. Newness for its own sake, however, is not our concern here.

Although our prototype has been iteratively developed and reviewed by the researchers within our team based on a real-world hermeneutic scenario (Interpretation of Franz Kafka's *In der Strafkolonie*), we are interested to learn more about other scholars' experience with the prototype in order to evaluate the appropriateness of the postulates and the idea of hermeneutic visualization. To this end, the prototype has been launched on a website for other scholars to use[5]. Scholars can use the CATMA software to export their annotations and import it into the *Stereoscope* prototype.
In addition to it, the source code has been published on BitBucket[6] in order to give interested scholars the opportunity to contribute to the development. Being aware that our prototype can not address all eventualities of hermeneutic activity, we deemed it important to enable users to extend the repertoire of hermeneutic visualizations that can be used as arguments. The source code provides a sustainable visualization template that can be used to develop other visualizations.
Following Hinrichs and Forlini (2017), we encourage scholars to come up with new visualizations and adjust existing hermeneutic practices, in that way building "sandcastles" and experimenting with hermeneutic visualizations. The prototype itself necessarily has to be a generic tool, that is capable of supporting a diverse range of hermeneutic scenarios.

Finally, we hope that our research might inspire other researchers to investigate what premises need to be considered in order for visualization to benefit other interpretative approaches. Since some attributes like ambiguity are not specific to hermeneutics, but common to all theories of interpretation, this research might serve as a starting point for the development of respective approaches in other areas.

6 Acknowledgements

The research and the software prototype "Stereoscope" was developed as part of the 3DH project *Three-Dimensional Dynamic Data Visualisation and Exploration for Digital Humanities Research* at the University of Hamburg (04/2016–12/2018).[7] The project is conducted by Jan Christoph Meister. Associated members are Marian Dörk (University of Applied Sciences Potsdam), Johanna Drucker (University of California), Evelyn Gius (University of Hamburg), Geoffrey Rockwell (University of Alberta), Florian Windhager (Danube University Krems).
Furthermore, we would like to thank Jan Christoph Meister and Jan Horstmann for comments and suggestions on this paper.

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