LdoD Visualization

Reading *The Book of Disquiet* with Information Visualization Techniques

José Eduardo Brissos Raposo

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Supervisors: António Manuel Ferreira Rito da Silva
Manuel José de Freitas Portela

**Examination Committee**

Chairperson: Paolo Romano
Supervisor: António Manuel Ferreira Rito da Silva
Member of the Committee: Daniel Jorge Viegas Gonçalves

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Abstract

There is an increasing use of information visualization techniques in Digital Humanities to support the analysis of literary work. On the other hand, the raise of the e-book has triggered a variety of hardware and software solutions to provide a new materiality where the reading activity takes place. In this thesis, I propose a new metaphor to support the reading of literary works on a digital medium, which integrates information visualization techniques with plain text reading into the reading flow. This approach differs from the well-known dichotomy close and distant reading because its emphasis is not on the support of the analysis of the texts being read, but on providing a smooth flow between the focus and digression, which naturally occurs during a reading experience. In this context, I have created a solution to read and explore an unfinished book that can be read in any order - The Book of Disquiet by Fernando Pessoa. The research and design decisions for this work are geared towards achieving an appealing, rich and interactive online reading experience through a web-based application - LdoD Visual 1. The implemented features make use of information visualization techniques with an emphasis on exploring the modular nature of the book - since it is a fragmentary literary work, its reading can be fragmentary as well, while providing a smooth multiple flow reading experience. The developed application is an extension of the collaborative digital archive of the The Book of Disquiet - the LdoD Archive 2.

Keywords

Online Reading; User Experience; Information Visualization; Usability.

1 https://ldod.uc.pt/ldod-visual
2 https://ldod.uc.pt/?lang=en
Resumo

Tem-se verificado um aumento do uso de técnicas de visualização de informação em Humanidades Digitais para a análise de trabalho literário. Por outro lado, o surgir do e-book levou a uma variedade de soluções de hardware e software para criar um novo meio para a leitura. Nesta tese, proponho uma nova metáfora para suportar a leitura de trabalho literário num meio digital que integra, num fluxo de leitura, técnicas de visualização de informação com a atividade de leitura do texto. Esta abordagem difere da conhecida dicotomia close and distant reading pois a sua ênfase não está na análise dos textos que estão a ser lidos, mas sim em proporcionar um fluxo suave entre o estado de concentração e divagação que ocorre naturalmente durante uma experiência de leitura. Neste contexto, criei uma solução para ler e explorar um livro inacabado que pode ser lido em qualquer ordem - o “Livro do Desassossego” de Fernando Pessoa. A pesquisa e decisões de design para este trabalho foram direcionadas no sentido de conseguir uma experiência de leitura online interativa e apelativa através de uma aplicação web - o LdoD Visual ³. As funcionalidades implementadas recorrem a técnicas de visualização de informação com ênfase em explorar a natureza modular do livro - como se trata de uma obra fragmentária, a sua leitura pode também ser fragmentária, proporcionando uma experiência com vários fluxos de leitura. A aplicação desenvolvida é uma extensão do arquivo digital colaborativo do Livro do Desassossego de Fernando Pessoa - o Arquivo LdoD ⁴.

Palavras Chave

Leitura Online; Experiência de Utilizador; Visualização de Informação; Usabilidade.

³https://ldod.uc.pt/ldod-visual
⁴ldod.uc.pt
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1.1 Introduction & Objectives

Livro do Desassossego or The Book of Disquiet by Fernando Pessoa is a fragmentary literary work that was left unedited and unpublished by the author. Forty-seven years after Pessoa’s death (1935), the book’s first edition was published in Portuguese in 1982. Ever since, multiple different editions of the book have been published throughout the years, showcasing a big interpretation disparity of how the book should be organized according to the editions’ authors and critics.

Provided the modular nature of the book, its fragments can be read without any particular order, offering the opportunity for a fragmentary reading of The Book of Disquiet - a reading path that can be built by the actual reader, instead of following a typical sequential reading that is bound to happen in a rigid defined story sequence.

For my Master Thesis, I have designed and implemented a web-based application to read The Book of Disquiet where the main objective is to give the reader a sense of choice and an active role while reading and browsing through the book’s different fragments, in what should be a pleasurable and immersive user experience for both humanities researchers or just interested readers.

To achieve this goal, I analyze and propose several features based on different information visualization techniques. Information visualization is a broad field that can be applied to a large domain of different areas, providing insight based on input data with different perspectives, summarizing relationships, identifying and comparing patterns, trends, outliers, finding correlations, among other tasks. The main objective of these information visualization techniques is the exploration and pleasurable reading of The Book of Disquiet.

The implemented solution is a relevant contribution for the analysis and exploration of The Book of Disquiet and digital humanities, and is an extension of the collaborative digital archive of The Book of Disquiet - the LdoD Archive [9].

1.2 Organization of the Document

This thesis is organized as follows: Section 2 reviews the related work I have researched in the context of my master thesis and proposes several features based on the related work that could be applied to the context of The Book of Disquiet. In section 3 I describe my implemented solution. In section 4 I describe how I have evaluated my solution with its results and analysis. I close this master thesis with my conclusions in section 5.
2

Background & Related Work

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2.1 LdoD Archive

LdoD Visual is an extension of the collaborative digital archive of *The Book of Disquiet* - the LdoD Archive [9]. In this section, I describe the most relevant features of the LdoD Archive for the context of LdoD Visual.

The LdoD Archive provides every visitor the possibility of reading *The Book of Disquiet* through four distinct expert editions - the first edition, edited by Jacinto do Prado Coelho, that was published only in 1982, and other 3 major critical versions that have been published since then by Teresa Sobral Cunha (1990-91), Richard Zenith (1998) and Jerónimo Pizarro (2010). Each edition is composed of a different number of fragments and fragments are ordered differently in each edition. The user can read these fragments while comparing their respective position across the expert editions, and they can also have access to other information that differs according to the edition.

In the LdoD Archive, the users can also create virtual editions - their own editions of *The Book of Disquiet* - by selecting fragments from each of the 4 expert editions, sorting, annotating and tagging them. This virtual edition creation can also be made in a collaborative manner by a group of users. There is also the possibility of labeling a fragment as belonging to a certain category. The group of categories in a virtual edition is designated as the virtual edition’s taxonomy.

Each fragment has different properties, such as its title, text, date and the edition and categories to which it belongs.

There are many more features and possibilities that can be explored in the Archive, such as more reading tools, original documents, more fragment comparisons, fragment search, games and writing variations based on the existing fragments ¹.

2.2 Information Visualization

In this section, I mention every topic and source of information I analyzed and considered relevant and related to my work's context and objectives. Most of my research is geared towards information visualization techniques applied to text data in literature.

Word Clouds [10] [11] [12] and Tag Clouds [13] consist of a list of several words that are displayed in a visual hierarchy and are used to visualize the main themes and content in small and large document collections in an intuitive way, displaying a bag of words that do not overlap and vary in size, style and color according to their frequency and relevance. Heimerl et al. developed “The Word Cloud Explorer” [11], a system that uses word clouds as its central visualization method for interactive text analysis.

While the previous techniques are relatively popular for their mentioned purpose, they lack the ability of displaying word relationships given their random placement of words. For this fact, other techniques

¹https://ldod.uc.pt/about/archive
have been introduced. **Phrase Nets** [14] display a node-link based diagram, mapping words as nodes with links as relationships, which are determined by regular expressions picked by the user. Viegas et al., while presenting *Many Eyes* [15] - a public web site where users can create interactive visualizations - make use of phrase nets to visualize what are the central relationships between characters of a novel using the text from all of its chapter previews.

**Word Trees** [5] have also been used to summarize text data relationships in a tree, where sentences are aggregated by a certain word that they share and then split into branches at a certain point where they diverge by another relevant word or other criteria. This is another technique featured in, once again, *Many Eyes* [15] - where one of the authors makes use of word trees to show frequent actions from a novel’s main character. These have also been used to visualize word occurrence across literary collections, as shown in figure 2.7.

**Arc Diagrams** [1] are used to visualize detailed patterns regarding word repetition, connecting repeated words across a text corpus with an arc, as shown in figure 2.1.

![Figure 2.1: Arc Diagram example. Repeated words throughout a text corpus are connected by an arc.](image)

Another technique used to summarize and compare occurrence of words is to display a set of **Fingerprint Matrices** [8], encoding the occurrence of certain words in a text corpus through different colors in a rectangle, as exemplified in figure 2.12. There are more attempts at making use of color to encode text data in a similar fashion. Kim et al. make use of this fingerprint concept to map colors to feelings in a web-based application called *Lexichrome* [3]. *FeatureLens* [2], a system that enables the exploration of patterns within text-based collections at different levels of granularity, also features a similar concept to highlight places, people, countries, etc. as shown in figure 2.2.

Wike Weber relies on the same encoding concept, suggesting a color code that displays word classes (nouns, verbs, adjectives, etc.), visualizing details regarding text genre, sentence structure and writing style [16]. *TextDNA*, a web-based visualization system, takes a similar but less rigid take on color as means to encode text data, using a configurable color field design to enable multiscale exploration of word usage data [17].

*Lexichrome* [3] also features **Treemaps** to visualize color frequency in associations with words as
Figure 2.2: FeatureLens [2], a system that enables the exploration of patterns within text-based collections at different levels of granularity, also features a fingerprint concept to highlight places, people, countries, etc.

Figure 2.3: Lexichrome [3] features treemaps to visualize color frequency in associations with words.

exemplified in figure 2.3.

Alexander et al. make use of network graphs to visualize text similarity between different books by William Shakespeare [18].

Plaisant et al. present an interactive visualization that features scatter plots to analyze the occurrence of erotic topics in Emily Dickinson [19].

**Text Skimming** [7] [20] is a technique that relies on highlighting words with different weights according to different criteria, such as word relevance. This technique can lead to quicker reading and provide the reader with a glimpse of what are the topics addressed in the text corpus. Brath et al. [7] make extensive use of text skimming for various purposes, such as weighting more frequent adjectives associated with fairy tale characters, visualizing movie review quotes that encode review score with bold length or highlighting the most relevant words in the first paragraph of "The Wizard of Oz" as shown in figure 2.11.

More traditional and popular information visualization techniques have been used for text data, such as Pie Charts, Bar Charts and Radar Charts to display word usage, along with Line Charts to visualize word occurrence evolution throughout a corpus of text or a document collection. Saif M. Mohammad
makes use of most of these techniques, along with word clouds, to present emotions tracking in mail and books [12], while Subasic et al. make extensive use of radar charts to visualize detected affect content in free text [21].

Jänicke et al. address “Visual Text Analysis in Digital Humanities” [22] and categorize most of these techniques as distant reading techniques, since they aim to generate an abstract view of textual content. After addressing, in contrast, close reading techniques - techniques that rely mainly on annotations and the use of different colors and underlining styles to lead to deep comprehension and thorough interpretation of text passages - Jänicke et al. analyze how close and distant reading techniques can be combined. After highlighting that the development of visualizations provide an overview of the data that highlights potentially interesting patterns, Jänicke et al claim that a drill down of these patterns for further exploration is the bridge between distant and close reading.

Diggersdiaries, a web interface to visualize a historical textual document collection [6] proposes multiple views for the user, featuring an overview of the content through a map with colored squares in which its color encodes a certain category - war, traveling, etc. - as shown in figure 2.9.

Speculative W@nderverse [4], a visualization tool designed to enable the analysis and exploration of a literary collection consisting of thousands of science fiction short stories, also presents an overview of the literary content by making use of an interactive map featuring a tree structure and representative tags display, as shown in figure 2.4.

Figure 2.4: Speculative W@nderverse [4], a visualization tool designed to enable the analysis and exploration of a literary collection consisting of thousands of science fiction short stories, also presents an overview of the literary content by making use of a tree structure and representative tags display.
A summary of studies surrounding some of these text visualization techniques can be found and explored by multiple criteria in the online text visualization browser [23]. Part of these studies summarized in the online text visualization browser are covered by Cao et al. in the second chapter of the book “Introduction to Text Visualization” [24].

From this related work section, it is possible to see the potential of applying information visualization techniques in digital humanities, as they can serve multiple purposes that are geared towards not only literary analysis but also pleasurable exploration for the user, who can be either a research expert or just an interested reader.

2.3 Related Work applied to The Book of Disquiet

The problem consists in designing and implementing a web application to read a book, namely The Book of Disquiet (“O Livro do Desassossego”) by Fernando Pessoa. The goal is to make use of information visualization techniques that provide additional insight in a pleasant way and also spark the desire of exploring and navigating through different fragments of The Book of Disquiet. In the next subsections, I analyze and propose several features that can contribute to the work’s objectives, adapting part of the analyzed related work to the context of The Book of Disquiet.

I have decided to add this section to my master thesis since part of these hypothetical features were adopted to my implemented solution in a way or another. It can be viewed as part of the brainstorming that resulted from the research that took place to build section 2.2.

2.3.1 Information Visualization

Information Visualization techniques can be very efficient when it comes to giving insight in a pleasing and interactive manner. They can help any kind of user - expert or not - in various tasks, such as achieving an overall view about anything, summarizing information, correlating data, promoting exploration and comparison, highlighting trends and outliers, visualizing network data and others. In this section, I propose several features that make use of said information visualization techniques in order to achieve some of the project’s goals. These techniques belong to different areas and types of tasks, such as reading guidance, user navigation, global view and/or exploratory analysis.

Reading guidance features consist in giving important information for the user regarding a specific fragment or even a collection or category of fragments, where the focus is on the fragment that is currently being read. User navigation features provide the user with an interface to navigate between different parts of The Book of Disquiet, in which the focus is in the relationship between the fragment being currently read and the remaining fragments of the book. Global view features have the objective of giving the user a summarized presentation or zoomed-out view of content from The Book of Disquiet,
where the focus is on the edition that is being read. Finally, exploratory analysis features present the user with information that is more focused in exploring relationships in The Book of Disquiet without necessarily converging to the task of reading.

2.3.1.A Fragment position comparison among other editions with parallel bars

Since there is a lack of a defined sequence given by the author for each fragment of the book, there is some interest in exploring the naturally modular properties from this outcome. Following this interest, there is an emphasis along the collaborative digital archive of the "Book of Disquiet" - the LdoD Archive - on giving users awareness of the fragments' position among the four editions. In the same fashion, it is interesting to develop a feature to empower users with the same awareness. This consists of summarizing the fragments that are not currently open in an aggregated view in a horizontal bar while highlighting the currently open fragment's position. This is similar to what most IDEs provide us with when we are presented with a shrunk view of the complete code that highlights just the code we are viewing at the moment. The user could also compare the position of the current fragment in other editions by simply having an extra instance of the same bar for each edition. The user would also be able to use this bar to navigate throughout different fragments, jumping across different parts of multiple editions. This feature can also explore the idea of customizing various sequences - for instance, a chronological sequence or a sequence based on text similarity between fragments. The user can also drag and drop each bar to different locations. There is a sketch example of how this feature would look in figure 2.5, which is inspired by the color scheme and layout at the LdoD Archive's reading section. This feature belongs to areas such as global view, user navigation and reading guidance.

![Figure 2.5: Sketch example of how the parallel bars would work for navigating through different fragments across several editions.](image-url)
2.3.1.B  Word Cloud

Another interesting way of exploring the book is by adopting word clouds. When browsing different editions at the collaborative digital archive of *The Book of Disquiet* - the *LdoD Archive* - we have the option of sorting and reading fragments by their attributed category (e.g. "art", "emotions", "dreaming", "action" and others). After being presented with a word cloud for a certain number of available categories, and clicking on one of them, the user would be redirected to a list of fragments that corresponds to the selected category. Another way of exploring this information visualization technique would be by selecting multiple categories by intersection or disjunction, redirecting the user to all fragments that belonged to every selected category or just one of them, respectively. This feature can also be integrated with an advanced search context. Besides encoding word frequency with font size and position, the word cloud can also encode relevance (TF-IDF metric, for instance) with different colors. There is an example of how this feature would look like in figure 2.6. This feature belongs to areas such as global view and reading guidance.

![Word Cloud Example](https://jason-davies.com/wordcloud/)

**Figure 2.6:** Word cloud example. Generated from one of *The Book of Disquiet* fragments at jason-davies.com/wordcloud/. The way this word cloud generator works is described at jason-davies.com/wordcloud/about/.

2.3.1.C  Word Tree

This visualization technique could improve the reading experience by giving the user the option of starting by a common word across the complete book - or a specific set of fragments - and then branching into its occurrences with short quotes, complemented with a display of the number of the fragment for a specific edition. The short quote will display the word in the sentence where it occurs. If there is a low number of words in that sentence, it will show more surrounding words from other sentences around
it. From this branching, the user could click on the quote for a redirection to the specific fragment from where it belongs. There is an example of how this feature would look like in figure 2.7. This feature belongs to the exploratory analysis area.

![Figure 2.7: Word tree of the King James Bible showing all occurrences of “love the” [5].](image)

2.3.1.D Global view - Side Page Stack

There are some differences between the experience of reading a book on a browser or other portable virtual book readers and the actual physical book. In an attempt to close this gap, it would be interesting to provide the user with a physical awareness of where the actual reading fragment is placed in the current edition by displaying the pages stack back and forth of the book, similarly to what other virtual browser readers implement - such as archive.org or openlibrary.org, as it is shown in figure 2.8. This feature belongs to the global view area.

2.3.1.E Global view: Fragment navigation through a colored squares map with user’s color selection by category

With the difficulty of attributing color to categories given its subjectivity, holding on to factors such as personal perception and cultural context, the user would have the option of assigning a color to a certain fragment category. Then, the user could navigate through the fragments, having a global view of the book with a map of multiple small squares, each of them colored with the previously user-assigned color. The user could mouse hover on each square, having a tool tip displaying additional information about the fragment which that square represents. The user could also finally proceed to the reading of the fragment by clicking on its respective square on the map. There is an example of how this feature would look like in figure 2.9. This feature belongs to areas such as global view and navigation.
Figure 2.8: archive.org provides the user with an overall view of the book with a side page stack, providing the user with a physical awareness of where the actual pages of the book are located.

Figure 2.9: Text navigation through colored square maps example taken from Diggersdiaries [6].
2.3.1.F Network Graphs: visualizing fragments' level of similarity

When reading a given fragment, the user could browse through similar fragments by multiple criteria - text, heteronym, etc. - being presented with a network graph that would provide a more visual representation of how close certain fragments are in comparison to others. The motivation for this feature comes off from the following scenario: if this feature took a more classic approach - for instance, providing a simple list with the 3 most similar fragments when reading fragment A, the user would be presented with similar fragments B, C and D. While the list would simply sort them, for instance, by text similarity, the user has no visual grasp in a case where fragment B happens to be extremely similar to A in comparison to C or D. With this visualization technique, fragment B's circle would show up a lot closer to fragment A in the network graph, while C and D would be located far more distant. There is an example of how this feature would look like in figure 2.10. This feature belongs to the reading guidance area.

![Network graph example](image)

2.3.1.G Text Skimming - word relevance visual weighting

This feature would consist in highlighting each fragment's word according to its relevance in the context of the entire book. The weight of this highlighting could be made recurring to a metric like TF-IDF. If a certain fragment's word occurrence is not as frequent across the complete book's fragment collection, it should mean that the word is particularly relevant for that specific fragment, therefore it would have a heavier bold highlighting in comparison to other words. The user would have a toggle button to activate this feature while reading a fragment. This feature belongs to the reading guidance area.

There is an example of how this feature would look like in figure 2.11.

2.3.1.H Fingerprint matrices

This feature gives the user the option of picking one or more particular words and having a global view of their occurrence through fingerprint matrices. This technique could also be applied for the most relevant words (for instance with a higher TF-IDF metric) of a fragment or the most frequent words in the book.
or a given category. Fingerprint matrices would consist in representing a fragment’s text as a rectangle with colored regions wherever the picked word would occur, having the option of viewing the entire book as a collection of these rectangles and the highlighted occurrence of the selected word. The user would also have the option of being redirected to the reading section of a particular fragment by clicking on its respective fingerprint matrix. As a possible use case, the user could pick the word “Lisbon” by typing it down or select another word from another list with the most relevant or frequent words, and then identify and read the fragments where the word had a stronger presence throughout a certain edition of The Book of Disquiet. This feature belongs to areas such as global view and exploratory analysis.

There is an example of how this feature would look like in figure 2.12.
2.3.1.1 Line, bar, pie and radar charts

This feature gives the user the option of picking one or more particular words and having different information visualization techniques available to visualize their presence in *The Book of Disquiet*. These techniques could also be applied for the most relevant words (for instance, with a higher TF-IDF metric) of a certain fragment or the most frequent words in the book or a given category. Line charts would be better suited to visualize and compare the evolution of a word's occurrence throughout the book or a given category. Bar charts and radar charts would be effective at conveying the extent to which the occurrence of a word is more prominent than another. Pie charts could be used to visualize, for example, the 5 most relevant words of a certain fragment, since they don't scale very well with too many pieces of data. This feature belongs to the exploratory analysis area.

Table 2.1 summarizes each of these features from the related work applied to *The Book of Disquiet* according to its respective areas.

<table>
<thead>
<tr>
<th>Feature/Area</th>
<th>Reading Guidance</th>
<th>User Navigation</th>
<th>Global View</th>
<th>Exploratory Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel Bars</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word Cloud</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Word Tree</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Side Page Stack</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Squares Map</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Network Graph</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text Skimming</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprint Matrices</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Charts</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Table 2.1: Summary of each feature and its respective area.

2.3.2 Content Access

The feature suggestions in this section of the dissertation are geared towards giving the user a more satisfying and appealing access to the content across *The Book of Disquiet*. While not having an information visualization technique as its main concept like in the previous section, each suggestion still tries to meet the goal of achieving a more appealing reading experience.

2.3.2.A Original Document View (*facsimiles*) with virtual magnifying glass

Just like it's possible to achieve at the *LdoD Archive* - as shown in figure 2.13 - this feature would consist of a toggle button that would display the original, physical fragmentary piece that's being read by the user. This would provide the user with a grasp of reality based on original parts of the book. Finally, the user can use a virtual magnifying glass to amplify certain parts of the original document view, in an
attempt of bringing a more physical fragment reading experience to the user.

Figure 2.13: The collaborative digital archive of The Book of Disquiet - the LdoD Archive - provides the original document view of the fragments from the book.

2.3.2.B Fragment History

This feature consists of giving the user the option of viewing a list with her last viewed fragments from whichever The Book of Disquiet edition was being read. The user has additional information on how she reached a certain fragment - for instance, if it was by simply requesting the next page or by selecting a similar fragment by text through other features, also having the possibility of going back to that same fragment.

2.3.2.C Word search

Similarly to what other web browser book readers, such as Kindle Cloud Reader, 24Symbols, Archive, Open Library, Smashwords and others already implement, the user can have the option of searching for a particular word across the book.

2.3.3 Usability

The feature suggestions in this section of the report carry the intent of improving the task of reading, making it easier and more efficient.
2.3.3.A Night Mode

Since the blue component of white light is harmful for the human eye and can have a negative impact on our sleeping cycles, it’s always preferable to avoid direct contact with plain white light from a computer monitor at night. Similarly to what some famous websites already provide, such as YouTube, it is be interesting to have some kind of a "night mode" that would be triggered by pushing a button somewhere around the interface, switching to a darker colored theme. The user can also receive a notification to use the theme if the website is being visited at night.

2.3.3.B Font type, size, margins, columns, line spacing

Similarly to other web browser book readers, such as Kindle Cloud Reader, 24Symbols, Archive, Open Library, Smashwords and others, the user can control text formatting, namely font face, font size, margins, columns and line spacing.

2.3.4 Read 2.0

The feature suggestions in this section, while not being presentation-only like the previous features, can still be applied in a way or another in future work to meet some of the works’ objectives.

2.3.4.A Fragment Bookmark Manager - Favorites and Suggestions

This feature would consist in saving a fragment as a favorite fragment for later revisiting. Saving a fragment could also contribute for future similar suggestions based on multiple criteria, such as text similarity, chronological order, taxonomy, heteronym and others. It would also be interesting to show how many users saved a currently viewed fragment as a favorite.

2.3.4.B Random Fragment

Similar to what some websites do - such as Wikipedia does at en.wikipedia.org/wiki/Special:Random?lang=en - this would consist of a section of the solution that would simply provide the user with a random fragment and a suggestion to use it as her homepage, making an appeal to read a different fragment from The Book of Disquiet everyday, almost similar to a “fragment of the day”.

2.3.4.C Share Fragment in Social Media

This feature would give the user the option of sharing the currently viewed fragment in social media, such as Facebook or Twitter. This feature should probably be located somewhere near the option of saving the fragment as a favorite, as described in the bookmark manager section.
2.3.4.D Fragment Annotation and Text Highlighting

In another attempt of closing the gap between reading a book on a browser or other portable virtual book readers and the actual physical book, the user would have the option of writing and attaching a note to a fragment or highlighting a particular part of the fragment's text.
### Contents

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<tr>
<td>3.2 Solution Architecture</td>
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</table>
In this section, I describe the implemented solution - the LdoD Visual web application. The latest version of LdoD Visual is online, available for the general public through the Visual Book reading section of the LdoD Archive 1.

This solution is a product that derived from my Master Thesis Project solution proposal, taking into consideration everything I have analyzed and learned while researching and building the related work section. It is also a product from the continuous feedback I have received from my supervisor, co-supervisor (the application's client) and potential users while developing different versions of the application and testing it. Before describing the implemented solution's architecture and features, I describe the solution model that was used as the guiding point for whether or not a certain architecture or feature choice met the objectives and served the overall purpose of this work.

3.1 Solution Model - The Focus Switch Metaphor

Reading a book is a task where the reader constantly switches between two states of focus. The reader is either completely engaged in the task of reading or briefly disengages out of the act for various reasons. These moments of disengagement can be triggered, for example, by recalling what happened in previous chapters, picturing a description of a character or scenario, remembering a similar personal experience in comparison to what has been read, linking a new event to what has happened in the past or even trying to make a prediction out of it, among other possibilities. Part of the solution model revolves around this phenomenon, as it is intended to materialize and direct this constant in and out that happens while emerging and submerging into the text. It is important to highlight that, in comparison to a typical book where we have a rigid defined story sequence, The Book of Disquiet is a fragmentary literary work. This means that these moments of disengagement can turn into a chance for the user to reposition herself in another part of the book. This nuance leads to a reading path and global mental picture of the book that can greatly vary from reader to reader, opening up space for providing the user with an immersive experience where she can have a sense of choice and an active role while reading The Book of Disquiet.

3.2 Solution Architecture

The solution’s interface is composed of a group of different main menus - edition selection, reading, current user activity, new user activity and reading history menus. Before describing each menu in detail, it is important to explain the concepts that will be used throughout the rest of this solution proposal.

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1https://ldod.uc.pt/ldod-visual
3.2.1 Core Concepts

An information visualization technique, among other descriptions in previous sections, is a visual representation or metaphor that can provide insight and different perspectives about almost any type of input data, as shown by the multiple examples given above in the related work section.

Semantic criteria is the set of attributes that can be encoded by said information visualization techniques in the context of The Book of Disquiet, namely word frequency, word relevance (TF-IDF), chronological order, heteronyms, fragment categories and taxonomies. Text similarity is another semantic criterion that can be derived from word frequency and word relevance.

A user activity is an activity that can be selected by the user while reading a fragment from The Book of Disquiet, consisting in making use of an information visualization technique to encode different semantic criteria. An example of a user activity is “Find similar fragments by text similarity” to find fragments that are similar to the fragment that is currently being accessed, using a network graph as the information visualization technique that encodes text similarity - the semantic criterion that is chosen by the user while selecting the new user activity.

To achieve an intuitive and easy-to-use solution, independently of the user activity’s information visualization technique and encoded semantic criteria, the user selects a user activity by clicking on a button with a high-level description of what the user activity was designed to achieve (e.g. “Find similar fragments by text similarity”).

A reading flow is a sequence of accesses to fragments, done by a single user, such that the user progresses in the sequence of fragments through in-out-in, in-out-out-in and in-in subflows. An in-out-in subflow corresponds to a situation where the user is accessing a fragment, then by a single click moves to the current user activity menu, which will be described in the next subsections, were she has a complete view of the fragments according to some semantic criteria, moving back to a fragment through another single click. An in-in subflow corresponds to a situation when the user is accessing a fragment and accesses another fragment by a single click, for instance, switching to the previous page. Overall, the reading flow corresponds to the implementation of the focus switch metaphor.

3.2.2 Interface Structure: Menus and Navigation

Before describing the entire interface structure, there are some features and implementation details that take place in the entirety of the application:

- Most buttons are accessible through keyboard shortcuts, which are displayed at the end of each button label between straight parentheses. For example, a button with “[X]” at the end of its label
can also be triggered by pressing "X" on the keyboard, besides clicking on it. This is one more effort to maximize the user focus on reading the text and another extra step towards achieving our metaphor implementation.

- Most menus and user activities have instructions that can be expanded or revealed by either clicking on the instructions button or pressing "I" on the keyboard.

- Every action can be taken back by the user, be it by clicking escape on the keyboard, clicking out of the modal boxes, retreating in the matching buttons or their matching keyboard shortcuts.

- This application was developed and tested for most well-known desktop browsers, such as Google Chrome, Firefox and Opera. It is compatible with, at least, 16:9 resolutions for desktop browsers. *LdoD Visual* was not implemented for mobile devices with small screens and low resolutions.

### 3.2.2.A Landing Page: Presentation Video

As shown in figure 3.1, the user is presented with a video thumbnail upon arriving at the *LdoD Visual* landing page. After clicking it, a presentation video starts playing. This video explains the concept of *LdoD Visual*, its objectives and some use cases.

![Figure 3.1: Presentation video thumbnail at the landing page.](image)
3.2.2.B Landing Page: Edition Selection Menu

Scrolling down below the presentation video, the user is presented with the Edition Selection Menu, as shown in figure 3.2. In this menu, the user can select one of the four The Book of Disquiet expert editions represented in the LdoD Archive, by either Jacinto do Prado Coelho, Teresa Sobral Cunha, Richard Zenith or Jerónimo Pizarro. The user can also select one of the public virtual editions available at the LdoD Archive.

In LdoD Visual’s Edition Selection Menu, the user has some alternatives when it comes to filtering and browsing through these virtual editions. Only editions with a minimum number of fragments are displayed, and this number can be set in a slider. The user can also filter the virtual editions table by searching for a specific title or acronym (the virtual edition’s unique ID). Whether or not these virtual editions have available categories (taxonomy), the table can also be filtered to only show editions with either available or unavailable categories through a drop-down menu in the corresponding header. There is also a column for the number of fragments that each virtual edition possesses. The user can sort the virtual editions’ list by any of these columns by clicking on its header title, ascending or descending. The filter search ignores font case and special characters. By default, editions are sorted alphabetically by their title. There is an example of how this filtering can be executed in figure 3.3.

After clicking on the “Select edition” button, the user is taken to the First User Activity Menu.
3.2.2.C First User Activity Menu

After selecting an edition in the Edition Selection Menu, the user will be redirected to this menu. Here, the user has the option of exploring the selected edition through 3 different user activities in order to select a first fragment to be read, as shown in figure 3.4.

After selecting a first fragment, the user is taken to the Reading Menu.

3.2.2.D Reading Menu

In this menu, the focus is on reading the text of a selected fragment, as shown in figure 3.5. This menu features some elements of established browser book readers. There is a reading progress bar at the bottom that advances or retreats depending on whether the user clicks on the previous or next fragment buttons (or presses the left or right arrow key in the keyboard). There are previous/next
fragment arrow buttons that retreat/advance through the selected edition fragments depending on the currently selected user activity. There are some detail features, such as smooth animation between fragment change and smooth page scroll back to the top for the same matter. This smooth page scroll can also be triggered by clicking on its matching button or pressing “T” on the keyboard.

When the user stays inactive for more than 3 seconds, everything in this menu disappears with the exception of the reading progress bar and the fragment’s title and text, as shown in figure 3.6. Inactivity is timed when the user is not interacting with any button, progress bar or previous/next fragment arrow buttons. Is is then possible to trigger everything to appear again by doing a mouse hover on any of these elements of the menu. When the user scrolls down the page and the top buttons overlap the text, there is also a transparency trigger. These features turn out as an effort to maximize the user focus on reading the text and are another extra step towards achieving our metaphor implementation.

In this menu, there is a user activity “under the hood” in the sense that it resembles a user activity that does not break the reading flow - by clicking on the matching button (“Highlight the most relevant words”), the 4 most relevant words are highlighted in blue. This number was decided after extensive experimentation and fine tuning, trying to find a balance between actual relevant content highlighting and not highlighting too many words to the point it becomes irrelevant to do so.

This makes use of an information visualization technique - text skimming - to encode a semantic criterion - word relevance (more specifically, TF-IDF), even though it is not accounted as a user activity in the sense that it can be applied independently of what is the current user activity. Figure 3.7 showcases
Figure 3.6: When the user stays inactive for more than 3 seconds, everything in the Reading Menu disappears with the exception of the reading progress bar and the fragment’s title and text.

Deem-me a cabeça e o universo. As dores físicas, mais rítidamente dores que as morais desenvolvem, por um reflexo no espírito, tragávam incomodidades nelas. Trazem uma impaciência de todo que, como é de tudo, não exclui nenhuma das estrelas.

Nem contudo, não creio eu nunca, não perder, suponho, algum vez nem esquecer aquele convexo bastardo pelo qual vejo, como aí mais, consequências de uma coisa material chamada cérebro, que existe, por nascimento, dentro de outra coisa material chamada cérebro. Não possa ser materialista, que é o que, creio, se chama aquele convexo, porque se não estabelecer uma relação intuitiva — uma relação visual, direi — entre uma massa visível de matéria cinzenta, ou de outra cor quaisquer, e esta coisa eu que por trás do meu olhar vê os olhos e os pés, e imagina olhos e o que não existem. Mas, ainda que nunca possa cair no absurdo de supor que uma coisa possa ser outra só porque estão no mesmo lugar, como uma parede e a minha sombra nela, ou que depender a alma do cérebro seja mais que depender eu, para o meu trajecto, do veículo em que vou, creio, todavia, que há entre o que em nós só é espírito e o que em nós é espírito do corpo uma relação de convicção em que podem surgir discussões. E a que surge vulgarmente é a de a pessoa mais ordinária incomodar a que o é menos.

Dói-me a cabeça hoje, e é talvez do estômago que me dói. Mas a dor, uma vez superada do estômago à cabeça, vai interromper as meditações que tenho por trás de ter cérebros. Quem me tapa os olhos não me cega, porém, impede-me de ver. É assim agora, porque me dói a cabeça, ache sem vê-la nem nenhuma o espectáculo, neste momento monótono e absurdo, do que aí fora mal querer ver como mundo. Dói-me a cabeça, e isto quer dizer, que tenho consciência de uma ofensa que a matéria me faz, e que, porque, como todas as ofensas, me indigna, me predispõe para estar mal com toda a gente, incluindo a que está próxima porém me não atende.

O meu desejo é de morrer, pelo menos temporariamente, mas isto, como ditas, só porque me dói a cabeça. E neste momento, de repente, lembra-me com que melhor malhava um dos grandes prosadores diante isto. Desencantou, período a período, magia anônima do mundo; sos seus olhos imaginadores de parágrafos surgiram, diversos, os dramas humanos que há na terra, e através do lápis dos desenhos fábia erguer-se-ia no papel toda uma metáfora da desgraça. Eu, porém, não tenho nobreza estilística. Dói-me a cabeça porque me dói a cabeça. Dói-me o universo porque a cabeça me dói. Mas o universo que realmente me dói não é o verdadeiro, o que existe porque não sabe que existe, mas aquele, meu de mim, que, se eu passar as mãos pelos cabelos, me faz parecer sentir que eles sofrem todos só para me fazem sofrer.

Figure 3.7: By clicking on the button "Highlight the most relevant words", the 4 most relevant words are highlighted in blue.

There is also a button to go back to the edition selection menu and another button to show a modal box with the instructions for this menu.
Since the text will be read on a screen, the used text font is a sans serif font. The fragment title font and text font are the same used in one of the *LdoD Archive* reading sections.

From this menu, the user can also access the **current user activity menu** (section 3.2.2.E), **new user activity menu** (section 3.2.2.F) and **history menu** (section 3.2.4) by clicking on their corresponding buttons or pressing the matching keyboard shortcuts.

### 3.2.2.E Current User Activity Menu

In this menu, the user can access the currently selected user activity, interact with it and select a new fragment to read.

Different user activities make use of information visualization techniques to encode different semantic criteria as covered in section 3.2.3.

### 3.2.2.F New User Activity Menu

In this menu, the user can select a new user activity, interact with it and select a new fragment to read.

As shown in figure 3.8, each user activity is represented by a card with a title, a button with the corresponding keyboard shortcut between straight parentheses that will take the user to the activity, and an image that represents the information visualization technique for that user activity, that can also be clicked to access the user activity.

There are two types of user activities: user activities around the selected edition and user activities around the currently selected fragment. User activities are also sorted by semantic criteria - edition order, chronological order, text similarity, categories/taxonomy and heteronym.

The user activity card's image and button will be greyed out if the user activity is unavailable - for example, as shown in figure 3.9, if the currently selected edition has no taxonomy, user activities that revolve around the edition's taxonomy or fragment's category will not be available, displaying a message explaining why it is not available in the user activity's title.

Different user activities that make use of information visualization techniques to encode different semantic criteria are covered in section 3.2.3.
Figure 3.8: New User Activity Menu. There are two types of user activities: user activities around the selected edition and user activities around the currently selected fragment. User activities are also sorted by semantic criteria - edition order, chronological order, text similarity, categories/taxonomy and heteronym.

Figure 3.9: The user activity card's image and button will be greyed out if the user activity is unavailable - for example, if the currently selected edition has no taxonomy, user activities that revolve around the edition's taxonomy or fragment’s category will not be available, displaying a message explaining why it is not available in the user activity’s title.
3.2.3 User Activities - Information Visualization Techniques and Encoded Semantic Criteria

In addition to what has been described in the core concepts (section 3.2.1), in this section I describe the provided user activity by going through every information visualization technique and the semantic criteria they encode.

It is important to know that user activities are displayed differently if the user is viewing them through the Current User Activity Menu or the New User Activity Menu. I also describe these differences in the following sections.

3.2.3.A Network Graph

This information visualization technique consists of a network graph with hidden edges. Each node is a circle that represents a fragment from the currently selected edition. If the user clicks on a circle, she will be taken back to the Reading Menu with the corresponding fragment of that circle open to be read.

A central orange circle represents the fragment that is currently open at the time the user selected a new activity that made use of this information visualization technique. In case the user is viewing this activity in the Current Activity Menu, the central orange circle represents the fragment that was selected in the New Activity Menu and, therefore, is open in the Reading Menu.

There are blue circles surrounding the central circle. These circles represent other fragments from the edition. The closer they are to the orange circle, the more similar they are to the orange circle in what regards to the encoded semantic criterion.

Position encodes the relative similarity. The closest circle, or the most similar fragment in relation to the semantic criterion, will always start in the same position, be it 5% or 100% similar. Then, the other circles will be placed in more distant positions depending on their similarity.

Color encodes the similarity in percentage. There is a blue color range - a 100% similar fragment will have its corresponding circle colored in light blue, while a 0% similar fragment will have its corresponding circle colored in dark blue.

In case the user selects a different circle from the central orange circle while viewing the activity through the current activity menu, this circle will become colored as purple. This behaviour is implemented so the user never loses the focus on the initial orange circle that was selected while performing the activity in the New Activity Menu.

This form of representation is meant to highlight the fact that we want the visualizations to be used not only as exploration and navigation tools, but also as forms of registering the act of reading itself. Readers are thus able to see where they stand in relation to an initial reading decision.

The user can put the mouse cursor over the circle so that a label is displayed, showcasing the title...
and the value of similarity in percentage.

Besides being possible to drag and zoom the network graph using the mouse pointer and mouse wheel, the user can also use the green navigation buttons to drag, re-size, zoom in and out of the network graph.

This information visualization technique is used to encode similarity by text and taxonomy. Therefore, the user can access two user activities in the *New Activity Menu*: "Read similar fragments to the current fragment by text similarity" and "Read similar fragments to the current fragment by taxonomy".

When the user selects a new fragment from a new user activity that uses this information visualization technique, the previous and next arrow buttons in the *Reading Menu* let the user navigate in the edition in a different way: fragment number 0 will be the fragment that corresponds to the orange circle, fragment number 1 will be the fragment that is the most similar to fragment number 0 and the last fragment will be the least similar fragment.

Figure 3.10 showcases an activity resorting to this visualization.
Figure 3.10: User activity resorting to a network graph. Position encodes the relative similarity. The closest circle will always be in the same position, be it 5% or 100% similar. Color encodes the similarity in percentage. There is a blue color range - a 100% similar fragment will have its corresponding circle colored in light blue, while a 0% similar fragment will have its corresponding circle colored in dark blue.
3.2.3.B  Word Cloud

Word clouds are used in user activities to encode the categories of a certain fragment or taxonomy (group of categories) of the selected edition as the semantic criterion, as shown in figure 3.11. It displays each category with different colors and in a font size depending on the number of fragments that belong to that category. The user can access two user activities involving word clouds in the New Activity Menu: “Explore fragments from this edition by the categories to which they belong (taxonomy)” and “Explore more fragments from the same category/categories of the current fragment”.

The interaction with this information visualization technique consists of clicking on a certain category. The user is then redirected to a custom squares map that highlights the fragments according to the categories, as described in section 3.2.3.C.

Heimerl et al. developed “The Word Cloud Explorer” [11], a system that uses word clouds as its central visualization method for interactive text analysis. Its results showed that even though word clouds are aesthetically pleasing with its words disposed in different angles, users don’t find them very functional and easy to use. Thus, results showed that participants preferred sequential layouts, where words are placed horizontally without any kind of inclination or angles for aesthetic purposes. For this reason, the word clouds in LdoD Visual follow that same layout property.

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Figure 3.11: User activity resorting to a word cloud to encode an edition’s taxonomy.
3.2.3.C  Custom Squares Map

This information visualization technique consists of squares linked by arrows. It is similar to the network graph if we picture the squares as nodes and the arrows as edges. Likewise, each square represents a fragment from the currently selected edition.

This group of squares linked by arrows are a global view of the currently selected edition, and suggest a certain order from the arrows. This order depends on the encoded criterion. Each square’s color and highlighting also depend on the encoded criterion.

Similarly to network graphs, there is a special color highlighting for each square. A square will be orange if it is the square that was selected through the new user activity menu or purple if it is the currently open fragment while viewing the user activity through the Current Activity Menu.

The user can select user activities involving this information visualization technique encoding different semantic criteria:

- **Edition order.** Fragment squares are sorted by order of the currently selected edition. If the user places the mouse cursor over a square, it will display a label with the fragment title and its position in the edition, almost as if it was a page number. The user activity is called "Explore fragments by this edition's order". There is an example of a user activity involving this information visualization technique and semantic criterion in figure 3.12.

- **Chronological order.** Fragment squares are sorted by the date in which they were created or published. Each square displays a two-digit number that represents the year from that date - for example, a fragment from 1927 will have its corresponding square with the number 27. Fragments without date have their corresponding squares greyed out. If the user places the mouse cursor over a square, a label with the fragment title and its date will be displayed. The user activity is called "Explore fragments from this edition ordered by date". There is an example of a user activity involving this information visualization technique and semantic criterion in figure 3.13.

- **Categories/taxonomy** Fragments are displayed exactly as if the semantic criterion was the edition's order, with the addition of highlighting in yellow the squares of the fragments from the selected category using the Word Cloud information visualization technique, as shown in figure 3.14. If the user places the mouse cursor over a square, a label with the fragment title and the categories to which it belongs will be displayed. Smaller yellow previous/next fragment arrow buttons will appear under the black previous/next buttons in the reading menu. These are used to move exclusively to the previous/next fragment belonging to the selected category, as shown in figure 3.15.

- **Heteronym** Exactly the same behaviour as the categories/taxonomy use case, but highlights in yellow the squares of the fragments that were signed by a certain heteronym. The yellow arrow
buttons are used to move exclusively to the previous/next fragment belonging to the selected heteronym. The user activity is called "Explore more fragments signed by the same heteronym of the current fragment".

**Figure 3.12:** User activity resorting to a custom squares map to encode an edition’s order.

**Figure 3.13:** User activity resorting to a custom squares map to encode fragments’ dates.
**Figure 3.14:** User activity resorting to a custom squares map to encode an edition's picked category through a word cloud.

**Figure 3.15:** After selecting a fragment from the custom squares map after picking a certain category, smaller yellow previous/next fragment arrow buttons will appear under the black previous/next buttons in the Reading Menu. These are used to move exclusively to the previous/next fragment belonging to the selected category. The same behaviour is applied when using said information visualization technique to encode a heteronym.
3.2.3.D Timeline

This information visualization technique consists of an interactive timeline.

The user is presented with the timeline centered in the time window around the currently selected fragment, as shown in figure 3.16.

There is only one user activity that makes use of this information visualization technique to encode chronological order as the semantic criterion - “Explore fragments around the date of the current fragment”.

Each timeline entry represents a fragment from the currently selected edition. Each entry consists of a rectangle with the fragment’s title, and it is inserted in its date point. Similarly to the color scheme for other visualizations, an entry will be orange if it represents the fragment that was selected through the New User Activity Menu or purple if it is the currently open fragment while viewing the user activity through the Current Activity Menu.

The possibility to drag and zoom the timeline time window using the mouse pointer and mouse wheel is implemented.

The user can navigate to a certain fragment by clicking on its entry.

![Figure 3.16: User activity resorting to a timeline to encode fragments’ dates.](image)

3.2.4 History Menu

In this menu, the user is presented with an interactive timeline that displays the fragments that have been read for the currently selected edition. Each history entry is a fragment, displaying its title and a
thumbnail that represents the information visualization technique of the user activity through which that fragment was reached, as shown in figure 3.17.

Besides having a similar interaction to the user activity that makes use of the timeline in section 3.2.3.D, the user can navigate back to a certain fragment that was previously read by clicking on its entry. Besides opening it in the *Reading Menu*, the state of the current activity at the time of reading that specific fragment will be fully restored and can be accessed through the *Current Activity Menu*.

![Figure 3.17: History Menu.](image)

### 3.2.5 Logo and URL share presentation in Social Media

The website displays its own logo at browser tabs and bookmarks next to its title, as shown in figure 3.18.

It also makes use of the Open Graph Protocol to display an enhanced URL share presentation in social media, as shown in figure 3.19.

![Figure 3.18: LdoD Visual logo appearing at the browser tab.](image)
3.2.6 Used Technology

In its core, *LdoD Visual* is a JavaScript single-page application written in React.js - a frontend javascript framework initially released by Facebook in 2013.

In order to have a single source of truth and manage state, I have used another JavaScript library called Redux.js.

To implement the visualizations, I have resorted to visualization libraries such as Vis.js and React-D3, more specifically a react component called react-d3-cloud.

It is also worth mentioning that there was some work made in regards to image editing resorting to Adobe Photoshop and video editing using Wondershare Filmora.

3.2.7 Back-end Server Communication

*LdoD Visual* is an extension of the collaborative digital archive of *The Book of Disquiet* - the *LdoD Archive*. Part of the needed information for this web application was retrieved through HTTP requests sent to the back-end server that also feeds the *LdoD Archive*, such as:

- The list of the available public virtual editions and expert editions
- The list of fragments belonging to each edition
• Each fragment’s title, text, date, heteronym, ID and other important meta-information

• The distances for fragment similarity by text, taxonomy and word relevance
4 Evaluation

Contents

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In this section, I describe the methodology I have followed to evaluate my work.

After implementing an initial version of *LdoD Visual*, I received feedback from the project’s client and 6 target users for about a month, which resulted in the implementation of several changes, features and improvements. There is a general summary of this phase in section 4.1.

After these changes based on the received feedback, I performed two types of tests - usability tests (section 4.2) and case studies, or utility tests (section 4.3).

I have then implemented some changes based on the feedback I have received from the users while performing these tests, which I summarize in section 4.4.

### 4.1 User/client Feedback Refinements

After discussing several details and features with my supervisor throughout the development of *LdoD Visual*, I have decided to spend about a month working with my co-supervisor (the project’s client) and 6 target users who were familiar with the context of the *LdoD Archive* and the *The Book of Disquiet*.

In this period, I demonstrated an initial version of *LdoD Visual* to these users and let them navigate in free roam, so they could give me their feedback after experimenting with *LdoD Visual* for a couple of days. In this period, I considered every single received suggestion and made several changes and improvements to *LdoD Visual* while receiving more feedback. Other changes were also made in this period from further discussion and feedback from my supervisor.

In the following list, I describe the feedback I have received and the answers to that feedback through new changes to *LdoD Visual*:

- "There should exist more information about *LdoD Visual*’s concept, use cases, how and which data is driving the visualizations, etc.". To answer this, I added expandable instructions throughout the entire application and recorded and edited a presentation video for the landing page to explain the concept of *LdoD Visual*, its objectives and some use cases.

- "There should be a way to only display virtual editions in the virtual edition table with a certain minimum number of fragments". To answer this, I have implemented the slider in the *Edition Selection Menu* to filter the virtual edition table to only show virtual editions with a minimum value of fragments. The default value is 50 fragments. This value was suggested by the project’s client.

- "There should exist a user activity that made use of the timeline visualization used for the History Menu in order to encode the fragments’ date". To answer this, I have implemented the user activity as described in section 3.2.3.D.

- "There should exist some clear difference between the activities that use the squares map to encode the edition’s order and chronological order, besides the gray squares for fragments without
To answer this, I have changed the squares map when encoding chronological order so that each square would show the last 2 digits of the year of its corresponding fragment’s date as shown in figure 2.9.

- "The network graph surrounding circles should all have the same size and a color scale". To answer this, I have revamped the network graph, making a better use of available space with different circle positioning and sizes, along with the suggested color scale as described in section 3.2.3.A.

- "The category highlighting in the squares map is not immediately obvious". To answer this, I have added a title for the squares map where I explicitly show the highlighted category in a square with the same yellow color scheme as shown in figure 3.14.

- "The reading menu should be cleaner, more color neutral and have some elements from e-book readers, such as a reading progress bar and hiding unused panels". To answer this, I have completely changed the Reading Menu from a gray and blue theme, as shown in figure 4.1, to what is now currently implemented, as shown in figure 3.5.

- The previously used font for the fragments’ title and text would degenerate to Times New Roman for certain special characters. I ended up using the same fonts used in other reading tools of the LdoD Archive.

- "LdoD Visual buttons’ color scheme should be aligned with the LdoD Archive’s theme". To answer this, I have changed the style of every button in LdoD Visual to match the LdoD Archive buttons’ style.

Other refinements involved implementing UX details such as smooth fragment transitioning, going back to the top animation and other details such as elements re-sizing/responsiveness and bug fixes, among other changes.
4.2 Usability Tests

The purpose of usability tests is to test the usability of the system - how usable, efficient and satisfying it is to use LdoD Visual. I have executed these tests with 11 volunteer users that have no expert knowledge on the LdoD Archive and the The Book of Disquiet. The results of this type of tests are objective and quantitative.

4.2.1 Protocol

Each usability test consisted of 4 stages:

1. Introduce the user to the LdoD Visual’s concepts and briefly demonstrate the system in about 5 minutes;

2. Let the user explore the system freely for about 5 minutes;

3. Ask the user to execute 10 tasks;

4. Ask the user to fill and submit a SUS (system usability scale) questionnaire.

For the first stage, I have introduced each user to LdoD Visual’s concept by showing the presentation video and talking about LdoD Visual while I moved around the application, demonstrating the most common usage flows and some use cases.
For the second stage, I let the user navigate freely around LdoD Visual for about 5 minutes so she could experiment what was demonstrated. I encouraged each user to ask any kind of questions and speak about whatever was going through their mind.

In the third stage, I asked the user to perform 10 tasks. For each task, I counted the number of errors and time taken to complete the task. In the following list, I describe each task in a slightly more descriptive and explanatory way than I did with the users. The tasks were the following:

1. Search, in the virtual edition selection table, the edition called "Intervalo e Interrupção no Livro do Desassossego" using the title filter and select that edition.

2. Search and select, in the virtual edition selection table, a virtual edition with categories by firstly filtering the table in order for it to only display editions with categories.

3. Select the same edition as in task 2 and select the first user activity that makes use of the squares map to encode edition order, choose the first fragment and then, without using the next/previous arrows in the reading menu, select the third fragment (through the current activity menu).

4. Select the same edition as in task 2 and select the first user activity that makes use of the squares map to encode chronological order and select a fragment from the year 1932.

5. Repeat the previous task and, in the new activity menu, select a new fragment with a similar date to the currently open fragment via the user activity that makes use of the timeline to encode chronological order.

6. Select a virtual edition called "Mallet", select the first user activity that makes use of a word cloud to encode taxonomy, choose any category and then select a fragment that belongs to the selected category.

7. Select the same virtual edition as of the first task, choose any fragment through a first activity making use of the squares map and then choose the most similar fragment by text to that selected fragment through another user activity.

8. Repeat the previous task and return to the firstly selected fragment through the history menu.

9. Select any fragment from the edition of the first task, select the first user activity that makes use of the squares map to encode the edition’s order, choose the first fragment, highlight the most relevant words and say out loud what are the most relevant words of the selected fragment.

10. Select the virtual edition of the first task, select the first user activity that makes use of the squares map to encode chronological order and select a fragment without date. Find a way to select a new fragment such that it is possible to select a new user activity that makes use of the timeline.
These tasks were always executed in the same order for each user, exactly from the same menus. These tasks were mainly focused on testing the usability and intuition of the user activities’ interaction with the information visualization techniques in order to explore and navigate through the fragments from the selected editions.

For the fourth stage, I asked the users to fill and submit a SUS (system usability scale) questionnaire. This is a quick test that is commonly used just to see if I have got something completely wrong rather than to measure usability with very high precision.

This questionnaire involved 10 statements for the user to answer how much he would agree with each one of them in a scale from 1 (completely disagree) to 5 (completely agree):

1. I think I would like to use LdoD Visual regularly.
2. I think LdoD was unnecessarily complex.
3. I think LdoD Visual was easy to use.
4. I think I would need help from a person with technical knowledge to use LdoD Visual.
5. I think that all of the LdoD Visual features were well integrated.
6. I think LdoD Visual shows a lot of inconsistency.
7. I think people will learn how to use LdoD Visual easily.
8. I think LdoD Visual was very confusing to use.
10. I needed to learn a lot of new things before I could use LdoD Visual.

The score of the SUS questionnaire is obtained by transforming the 1 to 5 scale in a 0 to 4 scale, with the following math:

1. For odd-numbered questions, take the user classification and subtract by 1
2. For even-numbered questions, take the user classification and subtract it from 5.
3. Multiply the sum of all of these modified values by 2.5, so the sum becomes a value between 0 and 100.
4. Take the previous value of every user submission and calculate an average value of the SUS scoring, which represents the final SUS score for LdoD Visual.

Besides these 10 SUS questions, I also ended up adding other questions in order to know:
• If the user had already used other software to read books in the past
• If the user had already read *The Book of Disquiet*
• What was the user’s educational level
• What age range did the user’s age belong to
• If the user thought she would have a good reading experience while using *LdoD Visual* (also in a scale from 1 to 5 like the 10 SUS questions)

These questions are not usually tied with the SUS questionnaires, but they gave me information I thought that could be interesting to possibly correlate with other results.

### 4.2.2 Results

<table>
<thead>
<tr>
<th>Task</th>
<th>Time (seconds)</th>
<th>Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task #1</td>
<td>6.1</td>
<td>0.89</td>
</tr>
<tr>
<td>Task #2</td>
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<td>Task #8</td>
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<tr>
<td>Task #10</td>
<td>9.7</td>
<td>0.09</td>
</tr>
</tbody>
</table>

*Table 4.1:* Time to perform each task in seconds and respective number of errors.

<table>
<thead>
<tr>
<th>User</th>
<th>Question</th>
<th>Sum</th>
<th>SUS Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>31</td>
<td>29</td>
<td>72.5</td>
</tr>
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</tr>
<tr>
<td>11</td>
<td>35</td>
<td>35</td>
<td>87.5</td>
</tr>
</tbody>
</table>

*Table 4.2:* SUS (system usability scale) questionnaire results.
Figure 4.2: Usability tests’ users’ age ranges.

Figure 4.3: Usability tests’ users’ educational levels.

Figure 4.4: Users’ LdoD Visual reading experience rating in a Likert scale.
4.2.3 Discussion/Analysis

In this section, I describe and analyze how users performed in each task and the suggestions and thoughts they have transmitted while roaming around LdoD Visual and performing these tasks. I also analyze the results of the SUS (system usability scale) questionnaire.

In average, every task was completed without exceeding the expected time and with basically no errors, with the exception of the last task, which was more difficult.

Task #1 was created to verify if users would find and correctly use the title filtering function in the virtual edition table. There was only one user who took more time than expected and suggested that the filtering message in the table should be darker and bold, so it would be more evident at first sight. During this task, it was also suggested that the "select edition" buttons should be positioned immediately in the first column next to each virtual edition's title or, in alternative, to make the title clickable so that virtual editions could be selected by clicking on their respective titles.

Task #2 was created to confirm if users would locate and correctly use the category filtering function in the virtual edition table. This task was completed in the expected time and without errors. Instead of having the options "Yes" or "No" in the drop down menu corresponding to showing virtual editions with categories or not, it was suggested that the options should be "With" or "Without" instead.

Task #3 was created to observe if users would correctly perform the user activity that made use of the squares map to navigate throughout an edition without using the next/previous fragment navigation arrows in the Reading Menu. This task was completed in the expected time and without practically any errors.

Task #4 was created to verify if users would correctly perform the user activity that made use of the squares map encoding the fragments’ date. This task was completed in the expected time and without practically any errors, with the only error being due to the user misunderstanding my description of the task.

Task #5 was created to confirm if users would correctly navigate through the menus and perform the user activity that made use of the timeline visualization. This task was completed in the expected time and without errors.

Task #6 was created to observe if users would correctly select a fragment that belonged to a category that they selected in a user activity involving the word cloud and squares map visualizations. This task was completed in the expected time and without errors. It was suggested that each word from the cloud should transform the mouse cursor to a "pointer" when hovering the mouse on them, evidencing that they are clickable.

Task #7 was created to verify if users would correctly navigate through the menus and perform the user activity that makes use of the network graph to encode text similarity. This task was completed in the expected time and without practically any errors, with the only error being due to misreading the
name of the right activity in the **New Activity Menu**. It was suggested that the green navigation arrows in the network graph should be removed as, in the opinion of one user, they are redundant since every action can be done with a mouse in a more efficient manner. It was also suggested that each circles’ arch positioning should be memorized when viewing the user activity in the **Current User Activity Menu** instead of it always being random in regards to the arch where each circle is positioned.

Task #8 was created to confirm if users would correctly use the **History Menu**. This task was completed in the expected time and without errors.

Task #9 was created to confirm if users made a correct interpretation of what were the most relevant words of a fragment when they toggled the most relevant words highlighted in the **Reading Menu**. This task was completed in the expected time and without practically any errors, with the only error being due to a user not locating the button to highlight the most relevant words straight away and starting to search in the **New Activity Menu**.

Task #10 was created to confirm if users understood why a user activity was not available with certain fragments and what they should do in order to select other fragments that supported that previously unavailable user activity. This was the most complex task, which explains why it took the most time out of all tasks. Even though most users ended up figuring what they had to do, one user did not completely understand what he had to do.

Most users had already used other software to read books in the past. Most users did not read *The Book of Disquiet*. It is also possible to observe that most users strongly agreed that they would have a good reading experience using **LdoD Visual**, as shown in figure 4.4.

Analyzing the SUS score, we can observe that the lowest scoring answer is number 4 (I think I would need help from a person with technical knowledge to use **LdoD Visual**). This makes sense as **LdoD Visual** is relatively complex to users that have no experience with the context of *The Book of Disquiet* and the **LdoD Archive**, which is the case of every volunteer user for these usability tests. Regarding the score, when a system scores a SUS score of 80.3 or more, it is considered to be in the top 10% of scores and the testing users are more likely to recommend it to others [25]. This means that if we are considering a SUS scale, **LdoD Visual** is a system with good usability, having a SUS score of 88.41.

### 4.3 Case Studies - Utility Tests

The purpose of these **case studies**, or **utility tests**, is to obtain information about the utility and quality of the experience while using the system. I have executed these tests with 3 users that have expert knowledge about the **LdoD Archive** and the *The Book of Disquiet*. These tests are important in the
sense they let us study **subjective** and **qualitative** aspects of *LdoD Visual*, which are more difficult to measure.

I will briefly describe each user’s most relevant qualities to *LdoD Visual*’s context:

- The user of the first case study is a postdoctoral researcher with a PhD thesis on *The Book of Disquiet*. This user has also worked, between 2012 and 2015, with the XML codification of a portion of *The Book of Disquiet*’s files that are used in the *LdoD Archive*.

- The user of the second case study is a PhD student from the PhD Program of MATLIT (Materialities of Literature), which is a doctoral program that addresses the material and technological mediations of literary practices. One of its research fields are digital humanities. This user has a BSc and MSc in graphic design.

- The user of the third case study is another PhD student from the PhD Program of MATLIT, who also has a BSc and MSc in graphic design. This user is connected to the *LdoD Archive*’s usability since her PhD project involves creative practices through the situated use of the *LdoD Archive*. This user is one of *LdoD Archive*’s most regular users and has been organizing a plan of activities to teach *LdoD Archive*’s users how to use it and fully explore its various functionalities, including the creation of virtual editions.

## 4.3.1 Protocol

The testing protocol for this type of testing is more flexible in comparison to the usability tests’ protocol described in section 4.2. I have contacted each of the users by email, contextualizing them about my work and what I needed from them. I encouraged them to watch the presentation video and to roam around *LdoD Visual*, exploring certain editions and trying it out with their own virtual editions before we had our actual meeting to execute this testing.

During the testing in the meetings, I encouraged the users to use the entirety of *LdoD Visual* in front of me while “thinking out loud”. I asked several types of questions regarding the real utility, potential and reading experience that they thought *LdoD Visual* provides. I also asked them to talk about the differences they felt as more important to highlight in comparison to other tools and electronic readers available, as well as compare the reading experience of *LdoD Visual* to the *LdoD Archive*’s reading tools besides *LdoD Visual*.

In these 3 sessions, I extracted as much feedback as I could from these users who had very good knowledge applied directly to my work’s area, similarly to what was done in the user/client feedback phase described in session 4.1, but this time with more depth and space for each user.
4.3.2 Results

In this subsection, I summarize each testing session with each of the 3 users, listing the main points they brought up during each meeting.

4.3.2.A Case Study # 1 (Postdoctoral Researcher)

The testing session of this first case study resulted in the user bringing up several points and opinions that can be summarized in the following topics:

• The user thought that, overall, \textit{LdoD Visual} is a fantastic tool as it made him re-think \textit{The Book of Disquiet} and Fernando Pessoa's writing and creative process in a more visual way, even with his more in-depth understanding of the subject's domain. The user also referred that he would use \textit{LdoD Visual} very often for his projects.

• There was some curiosity on how the TF-IDF metric worked when highlighting the fragment's most relevant words in its text. After I provided an example of how a word could be considered relevant or not, the user said he wished I would give a similar explanation in the presentation video or in the \textit{Reading Menu} instructions besides only stating that the TF-IDF metric is used.

• \textit{LdoD Visual} shows up as a very useful tool for the kind of work this case study user does around \textit{The Book of Disquiet}. There was an interest in editing his \textit{LdoD Archive}'s virtual edition he works on frequently in order to make it public so he could access and explore it through \textit{LdoD Visual}. This virtual edition was about the philosophical readings of Pessoa, and a big part of the work was to label categories to each fragment based on that theme. It was very appreciated the fact that it would now be possible to visualize the built taxonomy through \textit{LdoD Visual}'s user activities with word clouds and category highlighting through the squares map. It was a very interesting and more visual way of exploring the virtual edition and the relationships and analysis that can be made in the Archive.

• For the kind of work mentioned in the previous topic, this user suggested that a very useful user activity for him would be one that uses a word cloud to show the more frequent words in the currently selected fragment, displaying the number of occurrences when hovering the mouse on a certain word, saying that he would use this feature very often.

• The yellow arrows that show up in the \textit{Reading Menu} after selecting a certain category through a user activity with a word cloud was very appreciated since it made it possible to only read fragments from that category without losing the context of the other fragments that did not belong to that selected category.
• The user gave an interesting example of a use case around his virtual edition using *LdoD Visual*. Part of his project consisted in labeling fragments belonging to a category called “Metaphysics”. His virtual edition was created using every fragment from the expert edition by Jerónimo Pizarro, which has its fragments sorted by chronological order. By exploring the edition's categories through *LdoD Visual*'s user activity with word clouds and category highlighting through the squares map, it was possible to verify that the category “Metaphysics” was present in some parts of the edition from start to finish. It was very curious and interesting to the user since he did not have such a visual representation in his mind about this fact prior to using *LdoD Visual*.

• The user also liked the *Reading Menu* and thought it was very clean and usable while certainly providing a good reading experience as he went through the fragments.

• *LdoD Visual*, albeit having huge potential, could be more informative for non-experts users with, for example, extra videos scattered around the menus that explained more use cases and how they can be useful. The user also suggested that I could “sell the concept” to the non-expert users by explaining, in the presentation video, that *LdoD Visual* is a tool that can branch into two purposes when it comes to reading the book: in a more ludic way or rather in a more researching mindset. Since it is a big shift of paradigm regarding how to read a book, it can take some time and patience to assimilate everything.

**4.3.2.B Case Study # 2 (PhD Student A)**

In this subsection I describe the feedback from the user of the second study case, which can be summarized in the following topics:

• *LdoD Visual* is a website that requires a lot of user interaction, since it allows customizing the reading experience of *The Book of Disquiet* in a very well executed manner.

• The presentation video was a great way of contextualizing the non-expert user, since *LdoD Visual* has some intrinsic complexity. The video explained the concept and use cases with clarity, along with the possibilities *LdoD Visual* brings.

• The way *LdoD Visual* proposes the reading and exploration of the fragments through information visualization techniques was very interesting and provides the user with associative possibilities between the fragments that make the reading of *The Book of Disquiet* a lot more free and customizable. Even though the starting point is always an edition, the user is empowered with an incredible mobility inside the options in the new user activity menu.

• The reading path, regardless of the edition or the reader, always varies from reader to reader, and *LdoD Visual* has even more relevance than the multiple reading sequences by association that the
LdoD Archive provides.

- The idea of giving the user the freedom to, during her reading path, to substitute her criteria or to make use of another fragment so that it becomes the beginning to a new reading path was very appreciated. It's like each fragment is an open door for the book and to new possibilities, which matches very well with the fragmentary idea of *The Book of Disquiet*.

- The concept of new user activities around the currently selected fragment is what was most appreciated from *LdoD Visual*. The possibility of exploring editions as a starting point, albeit very interesting, still comes up as an objective fragment relation proposal and inside the selected edition’s logic (by edition order, date, categories, etc.). The real reading customization strength comes from the activities around the currently selected fragment. If the reader stops and tries, for example, to continue her reading path with an user activity that is related with reading similar fragments by text to the currently selected fragment, there is already a reflexive question that is specific to the reader and the navigation method centered around the selected fragment becomes the medium for the user to be able to read around an idea that is interesting to her. In *LdoD Visual*, the reader is able to navigate through the fragments according to what is desired, having a visual reference of the type of navigation and exploration that is being performed in *The Book of Disquiet*.

- Since the last point was so much appreciated, it was proposed to separate the user activities in the *New User Activity Menu* by activities that were related to the currently selected fragment and activities that were related to the selected edition. Besides highlighting a more interesting subcategorization, it also separates the first 3 initial activities in the *First User Activity Menu* from the new ones that are displayed in the *New User Activity Menu*, improving the navigation through the user activities as a whole.

- The possibility of using keyboard shortcuts was appreciated, as it improves the navigation experience and brings some reading comfort while using *LdoD Visual*.

- User activities that used information visualizations techniques like the network graph and the word cloud were appreciated as they do not impose a very strong hierarchical visualization.

- The user activity that makes use of the timeline was this user’s favorite visualization as it gave a very visual and clearer perception of how close certain fragments were according to their date, along with a rich and ludic interaction by zooming and dragging the visualization.

- On a side note, it was proposed to use the title and text fonts in the reading menu for the entire application and to change the reading progress bar to red, so *LdoD Visual* matched a little bit more with the *LdoD Archive*’s theme and identity.
4.3.2.C Case Study #3 (PhD Student B)

The testing session of this third case study resulted in the user bringing up several points and opinions that can be summarized in the following topics:

- The presentation video was really well made - the voice and instructions were very clear and the concept and use cases were very well presented. The user appreciated the fact that there was an intention of transmitting the idea with clarity.

- \textit{LdoD Visual} is the “first face” of a concept that has huge potential and opens up a lot of possibilities. It gives users like her the possibility of understanding the \textit{LdoD Archive} in terms of structure and system by outputting visualizations, and \textit{LdoD Visual} is innovating in that sense.

- \textit{LdoD Visual} shows up as a very relevant work that is starting to answer and open up perspectives on what is possible to do with the \textit{LdoD Archive}. It is a relevant work that connects humanities to information technology.

- The user stated, for example, that \textit{LdoD Visual} would need better color and graphic design choices so it would have a stronger connection with the \textit{LdoD Archive} brand. This was more of a side note since the user acknowledged that this would be a project for more than one person in a longer time window, and that nonetheless, \textit{LdoD Visual} is very well executed given my context as its author.

- Even though the concept and use cases are clear, there is a need to sell the concept for both the casual reader that just wants to use the visualizations in a ludic manner and the researcher mindset that wants to explore the fragments in a given way.

- The instructions could be more scattered and pop up as the user is using each feature for the first time instead of having a big chunk of the information in fewer places as it is in the present, in the instructions for each menu and activity.

4.3.3 Discussion/Analysis

Taking into account all of the feedback received from these case studies, I can conclude that the reception of \textit{LdoD Visual} was positive, both in terms of concept, execution and utility.

The presentation video was considered important to contextualize the users with the concept and use cases upon arriving at \textit{LdoD Visual}.

The users liked \textit{LdoD Visual}’s approach on how to read a book. They thought that it is a good match for the fragmentary idea of \textit{The Book of Disquiet}. The attempt to output a visual representation of the editions and fragments brings a new perspective on how to read and explore the \textit{The Book of Disquiet} and use the \textit{LdoD Archive}, being a relevant work for the area of digital humanities.
The second user also described her experience with user activities in a way that suggested that LdoD Visual's metaphor is successfully implemented.

I can also conclude that each user spent time with different parts and user activities of LdoD Visual. My analysis on this is that LdoD Visual seems to provide different uses for different users, and that the objective of customizing the exploration and reading experience of The Book of Disquiet was met.

We can also conclude that LdoD Visual is a tool that mainly offers two different possibilities: the possibility of navigating through The Book of Disquiet with a focus on the pleasurable assisted user-driven reading experience - our metaphor - and the possibility of navigating through The Book of Disquiet with a humanities researcher mindset, finding patterns, correlations and textual data insights. Both of these reading practices are possible resorting to the same engine - the user activities’ information visualization techniques, even though the first type of reading practice is LdoD Visual’s main focus.

The users also suggested that LdoD Visual is relatively complex and that there should exist more ways of welcoming non-expert users who are not aware of the problem and structure of The Book of Disquiet and the LdoD Archive, such as “selling the concept” both as a ludic and research tool and showcase the different uses and possibilities in more videos scattered around the application.

The users also acknowledged this concept as having potential and that it could be developed and expanded in a multitude of branches. While the execution was considered good for my work’s context, it felt like LdoD Visual can always have a new take on how it should be approached and that the room for new ideas and features is endless.

4.4 Post-tests Refinements

After performing the usability and utility tests covered in previous sections, I have implemented some changes based on the feedback I have received from the users while performing the tests.

In the following list, I describe the changes I have implemented and the feedback that motivated me to implement them:

- When performing the usability tests’ tasks, described in section 4.2.1, some volunteer users suggested that the “select edition” button should be located immediately in the first column next to each virtual edition’s title, so that it would be easier to select them without having to visually align the button with its respective virtual edition. Figure 4.5 shows LdoD Visual’s old version of the Edition Selection Menu before I have implemented this suggestion.

- When performing the usability tests’ tasks that involved word clouds, some users noticed that the mouse cursor would not change to a pointer when placing the mouse cursor over each word from the word cloud, and suggested that it should be changed since it was not so clear that the words
could be clicked. I have implemented this suggestion so that each word is now clearly clickable when placing the mouse cursor over it.

- When performing utility tests with the first PhD student (section 4.3.2.B), it was proposed to separate the user activities in the New User Activity Menu by user activities that were related to the currently selected fragment and user activities that were related to the selected edition. Besides highlighting a more interesting sub-categorization, it also separates the first 3 initial activities in the First User Activity Menu from the new ones that are displayed in the New User Activity Menu from the moment an initial fragment is selected through the First User Activity Menu, improving the navigation through the user activities as a whole. Figure 4.6 shows LdoD Visual’s old version of the New Activity Menu before I have implemented this suggestion, where there was no distinction between user activities around the selected edition and user activities around the selected fragment.

As described in each section of the usability and utility tests, I have received more good suggestions that could be implemented but, due to time constraints, it was not possible to do so.

![Image of LdoD Visual's old version of the Edition Selection Menu before being revamped to its current version, shown in figure 3.2. The "select edition" buttons were not located immediately in the first column next to each virtual edition's title.](image-url)
Figure 4.6: LdoD Visual’s old version of the New Activity Menu before being revamped to its current version, shown in figure 3.8. There was no distinction between user activities around the selected edition and user activities around the selected fragment.
5

Conclusions

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5.1 Conclusions

The Book of Disquiet by Fernando Pessoa is an unfinished book that can be read in any order. The modular nature of this fragmentary literary work brings endless possibilities to how The Book of Disquiet can be traversed.

The goal of this work was to design and implement a web-based application to read The Book of Disquiet, giving the reader an active role while reading and browsing through the book’s different fragments defining user activities that made use of information visualization techniques to encode different semantic criteria.

In order to achieve this, I have mainly researched and analyzed papers and books about applying information visualization techniques to textual data and literature. After this phase, I took into account everything I have researched to write about how I could apply these information visualization techniques and other publications’ ideas to the context of The Book of Disquiet, in such a way that would suit my work’s objective.

I also created a solution model - the Focus-switch metaphor - that was used as the guiding point for whether or not a certain architecture or feature choice met the objectives and served the overall purpose of this work.

After designing the solution architecture and implementing an initial version of LdoD Visual, I received feedback from the project’s client and 6 target users for about a month, which resulted in the implementation of several changes, features and improvements. After these changes based on the received feedback, I performed usability and utility tests, which also resulted in the implementation of more changes and improvements.

I can conclude that I have achieved a solution that met its objectives by providing a system to read The Book of Disquiet with the features of LdoD Visual. I have created a new reading paradigm so that each user will have a unique reading experience while taking an active role in how this fragmentary piece by Fernando Pessoa can be enjoyed.

As a web-based application for exploring the process of reading, the LdoD Visual contains several features that correspond to what the LdoD Archive describes as "the simulation principle", that is, the ability to provide interactors with a reflexive engagement with the textual environment. Through a recursive process of going into the text and coming out of the text, readers are able to explore the Book of Disquiet as a particular kind of reading experience and they are also able to see how their acts of engaging with the text becomes registered in the visualizations. The implemented visualization techniques thus bring together the modularization of the text and the modularization of the reading of the text.
5.2 Future Work

LdoD Visual is a tool that has the potential to grow and become an improved version of what it already accomplishes.

One major improvement would be the possibility of saving the reading history state to a user account, preferably an LdoD Archive user account. This would be a logical extension since the process of reading a book can take days, weeks or months. Due to time constraints, the current version of LdoD Visual does not save the reading history state for each user.

Another major improvement would be to separate LdoD Visual’s landing page on other sub-pages so that the non-expert user would have a better grasp of the complexity surrounding LdoD Visual upon visiting the website for the first time. There are multiple options to be explored, such as making simple/advanced versions of LdoD Visual, scattering more short tutorial videos around the website or displaying a smaller set of instructions in small modal boxes just for the first time the user is using a feature.

Other improvement would be to match the LdoD Visual’s graphical style with the LdoD Archive, since LdoD Visual is an extension of the LdoD Archive.

It would also be interesting to consider all of the suggestions received in the final phase of this work during the usability and utility tests. Even if some are smaller details, there are multiple suggestions that make a lot of sense and would certainly be of added value without much implementation work.

Another improvement would be the possibility of saving a certain reading path and transform it into a new virtual edition just from LdoD Visual alone, instead of having to depend on the LdoD Archive to create a new virtual edition. This would be interesting since LdoD Visual revolves mainly around public virtual editions created in the LdoD Archive.
Bibliography


