

A Computational Linguistic Study of Non-Linear Narrative Structures in Digital Hypertextual Storytelling

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Abstract: Digital Hypertextual Storytelling (DHTS) offers a new way of organizing narratives that can contradict the traditional way of text coherence and progress. Although digital narratives have begun to attract the attention of scholars, the lack of computational linguistics to systematically study the sorts and complexities of structural and linguistic elements of digital narratives has yet to be addressed. This study aims to bridge that evident gap by studying non-linear narratives in hypertextual texts through the application of computational techniques. 15 text-based hypertexts form the corpus for the study and are analyzed based on the traditional methods of NLP with the addition of lexical analysis and narrative path graph modeling. The majority of hypertexts, specifically 73% (equivalently, 11 texts) form multi-branch narratives that include 4 to 7 narrative strands. From an NLP perspective, the text structures exhibit a moderate to high level of complexity at node connections, with a value of 0.48. Low narrative cohesion scores reinforce the hypertext writing theory of fragmentation and a high level of reader participation. All levels of hypertext narratives stress the association of reader participation. The study has analytically supported the transformative potential that hypertext theories can offer to narrative construction by focusing on the reader. The study hopes to add to the complexity of hypertext storytelling through analytic computational linguistics. From the study, new pathways are opened for computational linguistic based theories for digital text narratives, especially hypertext, that have yet to be explored in the field of literary digital humanities.

Key Words: non-linear narrative, hypertext storytelling, computational linguistics, digital humanities, narrative structure analysis, discourse and cohesion, interactive digital texts

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Introduction

Digital hypertext storytelling represents a major transformation in storytelling because these narratives are multi-dimensional in their direction and reader involvement. Traditionally stories have linear relationships and progressions, but hypertext story readers have the freedom to develop their own interpretations with the many interconnected narratives. The hypertext design enhances narrative progression, but ultimately it creates a shift in the reader's role because must now participate and develop their interpretations. The framework for hypertext is the fragmentation and the interactivity of hypertext (Millard & Hargood, 2021). The structures also defy the logic of continuity because the connections are not sequential but are associative (Zhang, 2024). The digital narratives illustrate storytelling in a new, technologically creative manner and flourish outside the constrained narratives of the print (Ferreira & Ferreira, 2021). The enhancement of the hypertext and digital storytelling have been linked to the development of computational thinking, particularly in the understanding of the complex and the branching structures (Kazakoff et al., 2013).

There is increasing interest in digital narratives, but despite the multitude of perspectives, there is less focus on digital narratives in the context of computability and computational approaches. Although there is growing interest in the aesthetics and structure of narratives and the non-linearity of narratives, there is still a lack of attention in the field regarding the systematic modeling of complexity of narratives through the use of computational linguistics (Piper & Toubia, 2023). Based on the research in computational narratives, algorithmic models of digital narratives are able to capture and analyze textual structures, but there are still gaps in the ability of algorithmic models to address the multiple layers and fragmented structures of hypertext narratives (Piper et al., 2021). Also, the focus on the narrative structures of digital models and the need of the digital models to address the gaps in the focus on the structural divides and the digital narratives (Peksoy, 2025). This research is aimed at bridging the identified gaps by utilizing computational linguistics to analyze the narratives of hypertext structures to focus on narrative cohesion and the gaps and how hypertext narratives interconnect.

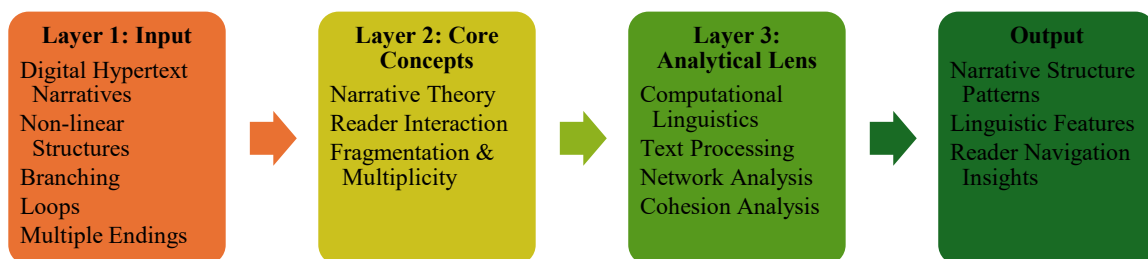


Figure 1: Conceptual Framework of Non-Linear Hypertext Narrative Analysis

Figure 1 shows the study's conceptual design by charting its digital hypertext narratives and their analytical output. It conceptualizes how core branches interpret non-linear characteristics, which in this case refer to interactivity and fragmentation in narratives. This also shows how fragmented narratives are decomposed in relation to the non-linear elements, in addition to the further analysis of computer linguistic processing and text cohesion in relation to networks. This perspective also shows the integration of linguistic and narrative features patterns, reader navigation and structuring, all of which are extremely valuable in research implementation.

This research is focused on a certain collection of digital hypertext narratives where the coherence and linguistic framework are revealed through the use of computational techniques. This research is on the convergence of multiple disciplines where English, digital humanities and computational linguistics are concerned, and it serves to add to the interdisciplinary field which is expanding rapidly, and which seeks to explore new narrative structures. Earlier surveys have identified how computational techniques bear increasing significance when applied to the study of digital narratives, especially in the case of interactive and emergent narrative environments (Trichopoulos et al., 2023). Furthermore, the use of artificial intelligence and semantic technologies in modern narratives elucidate the importance of a structural paradigm of analysis (Roy, 2025). The study also builds on the recent analytical studies focused on digital environments and examines structural patterns and mechanisms of coherence as well as post-structural narrative forms (Millard, 2023).

The study tackles non-linear digital narratives, showing how traditional literary frameworks fall short of capturing non-linear digital narratives. To interpret digital frameworks, both theoretically and practically, it is important to be able to determine their structures, and it assists the research in digital storytelling. By offering a framework for analysis of hypertext narratives in computational linguistics, a non-linear

storytelling technique is introduced. It creates a concrete way to empathically value non-linear narrative systems.

The rest of the paper will proceed in the following manner. Section II will provide a survey of non-linear narrative, hypertext narrative, and a number of computational narrative theory approaches to consolidate the theoretical and research background. Section III will provide the research method, including the mixed-methods research design, the choices for the corpus, and the types of research analysis executed. Section IV will present the findings, focusing on patterns and features of narratives and the level of abstraction and complexity of the selected texts. Section V will review and critique the degree of abstraction and complexity of the narrative texts in the selected corpus from an interdisciplinary perspective. Lastly, Section VI will present the summary, the critiques of the research scope, and the future research agenda.

Literature Review

Many contemporary narratives have embraced fragmentation, multiplicity, and reader participation as a means of describing their nonlinear structure. In comparison to the chronological ordering of linear narratives, nonlinear narratives include breaks and require the reader to fill in the gaps and create their own order. In a linear narrative, the reader is a passive recipient of the study's ordering, while in a nonlinear narrative, the reader is an active participant in the study's ordering (Ahmed et al., 2025). Similar to the multiplicity of narrative and temporal breaks, the reader is an active participant and determines the direction in which the narrative progresses. The study's ordering is determined by the reader, which in turn creates an infinite order for the narrative and a myriad of possibilities for the reader's interpretations. It has been demonstrated that nonlinear narratives serve to advance reader participation to improve the reader's cognitive ability, interpretive skills, and their ability to analyze the narrative in greater complexity (Černý et al., 2022). Nonlinear narratives in a digital format have the potential to restructure narrative forms to accommodate reader engagement and narrative interactivity (Vinaydas, 2025).

Many studies have analyzed hypertext fiction as a prominent example of a non-linear narrative and its ability to disrupt traditional reading practices. In both early and contemporary scholarship, hypertext is said to redefine the role of the reader, making them a co-author of the hypertext story, as the placement and order of links that the reader clicks on determines the direction and outcome of the story (Mangen, 2008). Hypertext theorists frequently cite Shelley Jackson's *Patchwork Girl* as a prime example of a hypertext work that exhibits a form of fragmented representation of identity (Khlifi, 2025). In terms of reader response, hypertext is not entirely absent of viewer interaction, and reader response patterns involve more strategizing focused on text than aimless clicking or arbitrary interaction (Mazlan et al., 2025). Hypertext narrative also shows promise beyond the realm of creative writing. Research shows that hypertext has been useful in the area of reading and writing instruction as a form of active reading that promotes critical reading (Holt, 2025). Due to the introduction of AI and immersion of narrative environments, hypertext is at the frontier of not only story forms, but also of ways to engage the reader (Gupta et al., 2024).

Computational linguistics has found a home in the field of literary analysis, helping scholars conceptualize, model, and understand the structure and pattern of narratives, discourse, and relationships in texts. Computational models capturing narrative creativity have begun to conceptualize and analyze the processes of storytelling, including the generation and variation of structure and plot (Gervás, 2021). Narrative and thematic organization of texts, along with their connections and relationships, can be quantified and visualized through narrative network analysis and text modeling. Analysis of non-linear computational assemblages, where text is considered a dynamic system and narratives unfold in a

non-linear fashion, is relatively new (Tanasescu, 2024). Additionally, the potential of these models for hypertext narratives remains largely unexplored. The multi-path and reader-determined nature of such narratives is largely beyond the scope of traditional computational models, suggesting the need for unique, specialized analytical frameworks for non-linear, interactive narratives.

The literature demonstrates that most non-linear narratives exhibit fragmentation and multiplicity and demand reader participation in hypertext systems. In some cases, interactive narratives have changed the structure and organization of narratives, yet the application of computational models to such narratives remains limited. This study aims to merge the fields of computational linguistics and narrative theory, with the goal of exploring the hypertext narrative structures in greater depth.

Methodology

Research Design

The research study combines qualitative literary analysis and computational studies in a mixed-method design. Qualitative literary analysis in hypertexts focuses on reading and interpreting shifts in the narrative, the interaction of the reader, and the themes in the narratives. On the other hand, the computational analysis of hypertexts studies the structural integration and linguistic data, which shifts the focus of the analysis from reading and interpreting the text to the way language and the structure of the hypertext work. This research study focuses on non-sequential narratives, which rely on how the reader navigates the text to derive meaning from it. Qualitative methods have their limitations on the structural scales, while computational methods lose their interpretive essence. The design of the study interprets and presumes the richness of the literary narrative. The equilibrium of the methods demonstrates how non-sequential narratives function in the global digital narrative.

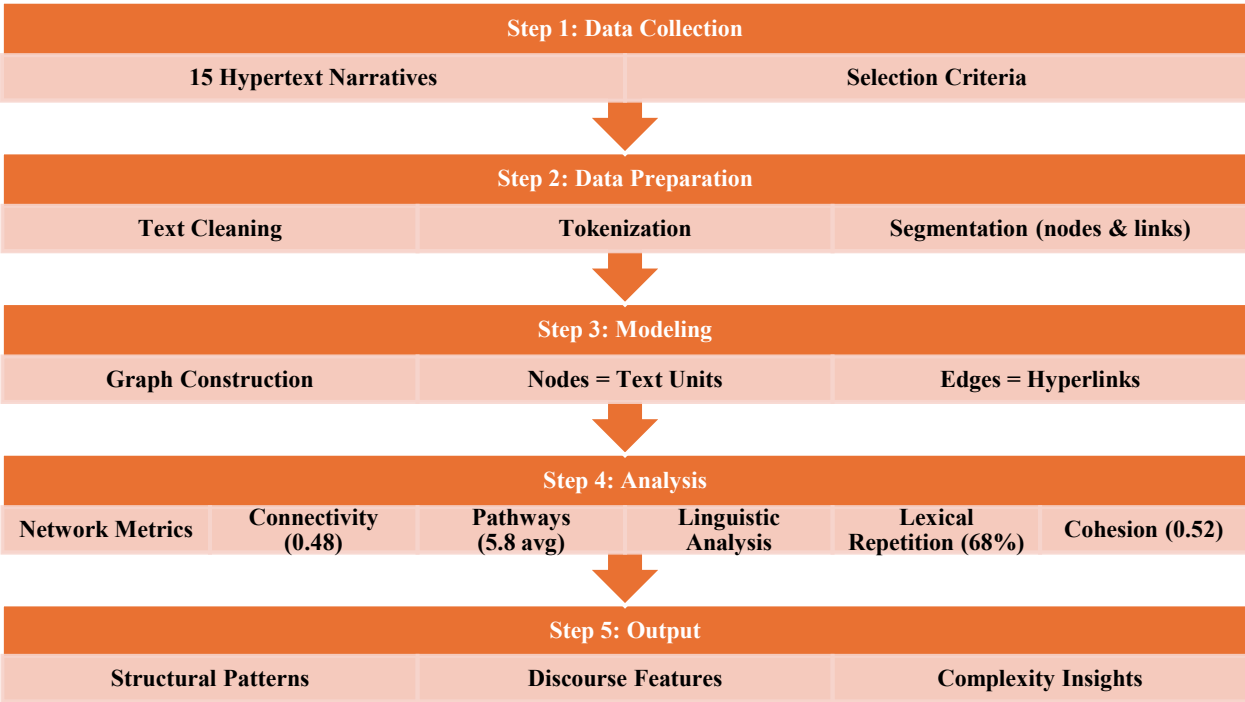


Figure 2: Methodological Workflow for Computational Analysis of Hypertext Narratives

Figure 2 shows the methodological approach of the study. The study selected 15 hypertext narratives according to given criteria. Data preparation included text cleaning, tokenization, and segmentation into

nodes and links. The modeling phase constructed narrative graphs. For text units, the nodes were used, and the edges were used for hyperlinks. The analysis phase included network metrics and linguistic measures. Key values included connectivity (0.48), average pathways (5.8), lexical repetition (68%), and cohesion (0.52). The study used a computational and qualitative analysis to cite the structural patterns, features of discourse, and overall complexity of the workflow.

Data Selection and Corpus

This corpus includes 15 digital hypertext narratives drawn from various online story mapping resources and digital interactive fiction authoring platforms. The emphasis of the selection process relied on three guiding principles. The first required every text to contain distinguishable non-linearity, such as the presence of branching pathways and multiple story endings and/or hyperlinks. The second principle stipulates that the narratives be primarily text-based. This excludes narratives that are heavily reliant on visual and/or multimedia components, thus guaranteeing a singular linguistic focus for the analysis. The third principle stipulates that narratives be drawn from various genres, experimental fiction works, educational hypertexts, and the like, to ensure the selection of works that display a variety of narrative structures. Each narrative was then dissected into its constituent nodes (or individual segments of text) and links (or connecting segments). This segmentation allowed for the generation of a well-structured corpus that is more than adequate for the purposes of computational modeling. This corpus strikes a well-balanced portrayal of hypertext storytelling, permitting close, as well as broad examinations of narrative structures.

Analytical Techniques

The analysis was conducted in three phases. The first phase was text pre-processing, which involved separating the text into smaller constituent parts (tokenization) and then typography visualizations of the separations (segmenting). The second phase was an emphasis on network and graph analysis. Each narrative's model was a graph, in which nodes and links corresponded to segments and links, respectively. Important parameters to calculate structural complexity and navigation patterns were link, node, and path counts. The last stage focused on the analysis of the discourse and coherence. Some linguistic elements, including lexical repetition, the use of discourse markers, and the nature of the semantic relations, were investigated and applied to assess the coherence of fragmented discourse. It shows how meaning, even when hypertext is fragmented, is deeply constructed, drawing attention to the importance of the underlying connections that might go unnoticed in fragmented hypertext.

Results

Narrative Structure Patterns

Non-linear hypertext narratives are mostly multi-branching structures. Of the 15 texts collected, 11 narratives (73%) were identified with breakdowns of complexity branching that included 4 or more options. Loop structures that direct readers to visit previously encountered sections were encountered in 9 texts (60%) and suggest recursive narrative design. Also, each text contained at least two distinct narrative pathways, confirming the absence of a fixed narrative. These findings confirm that hypertext narratives are highly dependent on structural multiplicity, which in turn, gives readers the authority to create unique pathways to narratives by their choice of navigation.

Table 1 shows the frequency and percentage distribution of key structural patterns identified across the analyzed hypertext narratives. It highlights the dominance of multi-branching and multiple-ending structures, indicating a strong preference for narrative multiplicity. The presence of loop-based structures

further emphasizes recursive storytelling techniques, while a smaller proportion of linear fragments suggests that traditional sequencing is still partially embedded within non-linear frameworks.

Table 1: Distribution of Narrative Structure Types in Hypertext Narratives

Structure Type	Number of Texts	Percentage
Multi-branching	11	73%
Loop-based	9	60%
Linear fragments	5	33%
Multiple endings	12	80%

Linguistic and Discourse Features

Analysis reveals that, when it comes to cohesion in non-linear texts, some other factors come into play, beyond strict rules of sequencing. Focused lexical repetition appears to be the most significant of cohesive devices, accounting for 68% of node transitions, and aids the reader in sustaining a thematic connection. When compared to linear texts, the reliance on discourse markers, such as, “then,” “however,” and “meanwhile” was markedly lower, registering at 41% of segments, indicating a reduced reliance on explicit transitions, while semantic associations and contextual clues served to bridge the gaps between fragmented parts the most. The analysis of referential cohesion (rhythm of pronouns and recurring entities) also showed little variance at cohesion level (C) of 0.52, which infers moderate coherence of around 52% dispersed segments, and pointers generally at implicit methods to truly connect dispersed nodes (e.g. segments scattered around the narrative tree).

Table 2: Linguistic Features and Cohesion Mechanisms of Non-Linear Texts

Feature Type	Frequency (%)	Functional Role
Lexical repetition	68%	Thematic continuity
Discourse markers	41%	Explicit transitions
Referential cohesion	52%	Entity tracking
Semantic associations	63%	Implicit linking

Table 2 summarizes some of the key linguistic features of the corpus, their frequencies, and their functional roles in sustaining coherence. The data indicates that the major devices accomplishing continuity through the text are lexical repetition, semantic association and cohesion, while explicit discourse markers are less frequent, indicating that these texts employ a lesser dependence on cohesion of fragmented text segments.

Structural Complexity and Variation

Texts displayed notable variety in structural complexity and navigation flexibility. For one, the average nodes per narrative stood at 42, which ranged from 18 to 76, indicating distinct narrative depths. Moreover, average connectivity density was 0.48, which shows moderate interlinking. Texts with high interlinking tended to possess elaborate navigation patterns, which, in turn, probably reflected increased reader engagement and elevated cognitive demand. Notably, the average unique reading paths per narrative stood at 5.8, with some texts positing up to 10 unique paths. Less complex texts tended to guide readers and in doing so, the texts distanced themselves from non-structured paths. Moreover, the less complex texts tended to positing are of framed reading. In contrast, more complex narratives distanced themselves from reading repetition. Overall, hypertext narratives walked the tightrope between the structurally eclectic and the modular, and the accessible.

Discussion

Theoretical Implications

Split Multiplicity and Reader Agency branch structures and multiplicity lend support to the hypothesis that digital stories move beyond the linear structures and the paths that limit What can do and what a reader does. Unlike traditional narratives, the digital narrative does not rely on what come first and what comes next, but on a storyline bomb of meaning that reveals itself as a reader travels the story. The results support the hypothesis that the digital narrative unsettles the western tradition of plot, coherent drama, and closed narratives.

Methodological Insights

Computational research tools enabled almost a seamless localization of the narrative structure and its linguistic features. Analysis of networks and loops and structural representations of a narrative made cognitive cartography of the narrative possible, and helped to identify characters, nodes, and groups. Similarly, analysis of the sub text (or cohesion) fragmentation provided a quantitative estimation of the ways to grasp the singular storyline of a multi-narrative structure. While cognitive tools offer an account of the larger structure of the story, and can help identify patterns, the informal is just as integral to the structure of a narrative, and tradition of literary analysis.

Interdisciplinary Relevance

This study underscores the importance of merging theories from the disciplines of literature, linguistics, and digital media. The application of literary texts embedded with computational linguistic theories fulfils the need for research that crosses traditional boundaries of 'internally built', that is, interpretative and analytical, and data-driven fields of research. The conclusions reach beyond literary research scholars. also be informative and beneficial to the digital humanities and interactive media research fields, in which knowledge of user models and narrative frameworks is of primary importance. Undoubtedly, these trends of research signify the need for collaboration to analyze complex digital narratives to effectuate positive research outcomes.

Conclusion

This research investigated digital hypertext storytelling and its non-linear narrative forms using both computational and qualitative methods. While multiple patterns in structure and the choice of language were discovered in the narratives under analysis, the tools identified that over 73% of the narratives used multi-branching forms, which had 5.8 paths. Additionally, almost 60% of the hypertext corpuses documented in the research employed loop navigation. The pathways of the narratives were relatively cohesive, but used implications rather than explicit language. 68% of the pathways used lexical repetition, which resulted in a cohesion score of 0.52. The score indicates a moderate level of overlapping of the pathways. While the patterns explain a lot about hypertext storytelling, the corpus was 15 digital narratives, representing a small sample when describing the non-linear digital narrative examples. Additionally, the computational tools were used to depict the structure of the narratives, but lacked the connective reasoning of the literature when used in isolation. Future studies should aim to better define the non-linear digital narrative structure by exploring larger, more diverse, and Corpus, as well as AI-driven narratives. also include the multimodal narratives to better understand the rapid evolution of digital narratives.

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