

Imagining the Continuously Present Past: Visualizing William Faulkner's Narratives and *Digital Yoknapatawpha*

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Abstract

Hosted out of the University of Virginia and funded by the National Endowment for the Humanities, *Digital Yoknapatawpha* is an international and collaborative project composed of William Faulkner scholars and technologists. Its goal is to create a comprehensive database of all the locations, characters, and events in Faulkner's Yoknapatawpha fictions with the aim of visualizing the data through a series of "deep atlases" and other displays. This paper traces the development cycle of a supplementary narrative structure analysis dashboard that allows users to explore the chronology, narrative status, and date range of all of the texts set in his mythic county. In doing so, it bridges some of the significant gaps between narratological theory and computational methods, opens up a conversation about representing narrative data, and suggests some possible avenues for research with the dashboard.

Introduction

A story, simply put, is a sequence of events. This definition has been in place at least as early as Aristotle's *Poetics*. What is much less simple to define is the constituent terms: sequence and events. Accordingly, schools of narrative theory have conceptualized events and their connection to sequentiality from radically divergent vantage points, ranging from defining the varied shapes of the sequence, their value at a semantic level, with regard to events' salience to the overall plot, their relationship with narrative point of view, and the interpretation of events by the reader, just to name a few [Frawley 1992] [Genette 1972] [Herman 2012] [Labatt 2005] [Leitch1986] [Reed 1973].^[1] Indeed, as more recent work on narrative shows, what narratives are and how they can be decomposed is anything but a settled matter [Baroni 2016] [Hansen 2017] [Phelan 2017] [Richardson 2019].

Despite these definitional challenges, researchers have been productively using narratological concepts to analyze texts since the early days of computing. In his exhaustive and insightful overview of the state of the field, *Computational Modelling of Narrative*, Inderjeet Mani covers the various approaches taken by computer scientists to decompose and generate narratives, while introducing an innovative mark-up language of his own: NarrativeML [Mani 2013]. With applications in language domains far outside literary studies and poised to disrupt everything from economics to medicine to forensics, work within the field of computational narratology has continued at break-neck speed. One recent work even claims that computational narrative generation has arrived at the moment of post-narratology [Ogata 2019].

Despite this substantial scholarly footprint and exciting advances, "[t]he flow of influences has historically been from narratology to computation," as Mani already lamented in 2013 [Mani 2013]. He lists narratologists' concern with discourse over fabula, and the relatively rudimentary quality of narrative generation, as causes of this one-way traffic. In addition to these, two large deterrents to the more widespread adoption of methods in computational narratology are the inter-related issues of scale and scalability. The first denotes the semantic level at which events are parsed. To be insightful for narratology, texts need to be broken down into meaningful narrative units that are more capacious than a predicate and more precise than a summary. Relatedly, the process needs to be scalable to a wide-range of texts to facilitate for insightful comparison. Up until now, the challenging trade-off has been that solutions at a scale appropriate for narratological analysis are not scalable because they require laborious human intervention, and unsupervised

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solutions are scalable but not at the right scale for narratological analysis. This is perhaps why projects that try to innovate narratology through computational methods are often mired in the proof-of-concept phase. Disappointingly, this has meant that the potential of all this groundbreaking work remains untapped by the larger community of literary scholars.

One single-author study that has managed to scale by dint of years of laborious coding, consistent revision, and substantial institutional support is the *Digital Yoknapatawpha* project (hereafter *DY*). Hosted out of the University of Virginia, *DY* was created through the hard work of over thirty Faulkner scholars putting in thousands of hours to code all of the locations, characters, and events in his Yoknapatawpha fictions into a relational database. Nearly a decade in the making, the site enables students, teachers, and scholars to explore fourteen novels and fifty-six short stories through a series of “deep atlases” based on maps Faulkner drew in 1936 and 1945 (<http://faulkner.iath.virginia.edu/>). The main interface is supplemented by a wealth of materials including: manuscripts, archival audio, historical photographs, textual commentaries, and other data visualizations. Though the project will continue to grow, *DY* is now robust enough to use as a scholarly tool, and several members of the team have already leveraged it to highlight new aspects of Faulkner’s writing [Burgers 2020] [Railton et al. 2015] [Robbins 2016].

The large tranche of highly-curated narrative data made available through *DY* offers an opportunity for computational narratologists to generate hereunto unimagined visualizations of narrative. This paper has far more modest ambitions. Instead, it contends that the most productive and intuitive approach to visualizing the shape of narrative is one that displays chronological order versus story order. This approach was actually devised by the Russian Formalists at the beginning of the twentieth century, and has been returned to time and again by digital humanists. By drawing on visualizations created for *Digital Yoknapatawpha* (<http://faulkner.iath.virginia.edu/narrativeanalysis.html>) and other adjacent digital work, I demonstrate the comparative power of such charts and the scalability of the method across different types of fictional texts. As such, the goal of this paper is to open up a larger conversation between digital humanists and narrative theorists, and consider the best practices for translating narratological concepts into encoded narrative data that can be productively visualized. A principal part of this conversation is the necessity of establishing a meaningful and shared visual language that clearly represents fundamental narrative concepts to a broader audience. Much of this language has already been in place for some time, but it has been scattered across different knowledge domains.

Bridging Humanities and Computational Narratology

Historically, there have been two important observations about narrative. The first, by Aristotle, is that a narrative has a beginning, middle, and an end, and that these are usually connected through causality. The second, by the Russian Formalists, is the separation of the *fabula* (story material) from the *syuzhet* (the way the author shapes the material), an insight mirrored concurrently by E.M. Forster who more strictly defines the separation as one between story and plot [Baroni 2016] [Forster 1927] [Shklovskii 1990]. As self-evident as these two distinctions are, operationalizing them into a hermeneutic for textual analysis is fraught with problems. As Gerald Prince aptly points out, “Narrative sequences...are semantic and not semiotic in nature” [Prince 2016]. That is to say, narrative sequences are not easily broken down into constituent parts based on linguistic and logical properties. The scope and length of individual narrative events are influenced by a whole host of factors, including rhetorical devices, extra-textual and inter-textual connections, figures, tropes, irony, narrative frequency, narrative speed, narrative authority, and narrative reliability to name a few [Prince 2016]. In this, it is hard to ignore the lessons of deconstruction and post-structuralist narratology [Fludernik 2005]. Any attempt to grab a single narrative thread tugs at the entire warp and woof of a text’s intertextuality. Delimiting a text into discrete units always imposes an artificial structure from without. This is to say nothing of the problems that arise when decomposing narrative if the experience of the reader is considered. After all, from a functionalist approach, narrative needs a reader to (re)-constitute it, and, therefore, narrative sequence is not a type of “deep structure,” but rather something that exists in discourse. John Pier observes that for functionalists, “sequence is assimilated into the broader question of intersequentiality and the dynamic relations occurring between the telling/reading and the told” [Pier 2016]. Which is to say, the sequencing of events in a text does not exist external to a reader. Thus, while it might be self-evident that a narrative sequence is a series of events, what constitutes those events and how they are constituted is remarkably difficult to pin down.

Translating narratological insights into computational methods poses a substantially different set of challenges. A major hurdle is computationally reproducing the cognitive faculties that allow human readers to understand texts with remarkable sophistication and accuracy. To decompose a narrative at any level of competency, a computer has to perform a series of inter-related and complex tasks including: natural language processing [Delmonte 2017] [Muzny et al. 2017] [Xie et al. 2019], spatial organization [Tenen 2018], narrative parsing [Bartalesi 2016] [Bögel et al. 2014] [Leonid 2017] [Wallace 2012], and understanding character entities [Barros et al. 2019] [Nijila & Kala 2018], to name but a few. Moreover, much of the work that has been done on the computational understanding of narrative falls outside the ambit of literary studies, and has focused largely on corpora within specific and, often, bounded knowledge domains, including, among others, economics [Lakoff & Narayanan 2010], law enforcement [Baber et al. 2011], medicine [Fócil-Arias 2018], education [Gutiérrez 2018], legal studies [Mahfouz et al. 2018], and reconstructing news narratives [Seonwoo et al. 2018]. This research is valuable for the insights it offers, but is not directly applicable to literary studies, because so much of literary production traverses multiple knowledge domains and deliberately subverts anticipated text structures. More simply, it is more probable that the language, style, and format of two fictional texts are more dissimilar than two medical reports, legal briefs, or, even news reports. This dissimilarity makes it challenging for an unsupervised computational approach to establish and detect patterns that can be iterated across a large corpus with a high degree of consistency.

Still, there have been significant attempts to generate a functional model for doing narrative analyses using digital methods. For example, *PlotVis* was a tool developed by a team at the University of British Columbia. It visualized narratives encoded in Extensible Mark-up Language (XML) and could be “customized by the teachers and students in order to accommodate various interpretations of a single piece of fiction” [Brown et al. 2013]. Operational from 2013-2016, *heureCLÉA* used human-annotation and machine learning techniques to produce a corpus of 21 annotated short stories, it was supplemented by the textual annotation and analysis tool “CATMA” [Meister & Geertz]. Using the data from *heureCLÉA*, another team designed *Narrelations*, an application that visualizes multiple levels of narrative [Schwan et al. 2019]. Meanwhile, Mark Finlayson created the *ProppLearner* corpus by annotating fifteen folk tales. Once annotated, the training data was used to analyze the morphology of different folktales using Propp’s method. Yet, even here a significant amount of human intervention was required to make sure that events were parsed properly [Finlayson 2017]. Indeed, as exciting as the results of the study were, the data collection process was necessarily labor-intensive and costly [Finlayson 2017].^[2]

Other recent investigations of narrative have relied more on natural language processing or some form of machine learning to aid with the parsing of text. Among these is the aptly named, “Syuzhet” package, developed by Matthew Jockers and available on CRAN (Comprehensive R Archive Network). The package allows users to draw on four different sentiment dictionaries to score the overall sentiment of a text or to chart how “positive and negative sentiments are activated across the text” [Jockers]. The advantage of this approach is that text analysis can be automated. While Jockers’s work has sparked a lot of interest, it has also received some criticism [Swafford 2015]. One issue is that his use of the word “plot” has no bearing on the concept of chronological order of events, but rather how different sentiment structures are articulated across a text. An alternative approach taken by Koichi Takeuchi uses a predicate-argument structure thesaurus to determine narrative states, actions, and change-in-states. This allows for “multi-dimensional relations between predicates with their arguments containing relations between the change-of-state and its goal” [Takeuchi 2016]. Though Takeuchi’s study is geared towards automatic narrative generation, it can also be used to decompose a narrative. Being able to detect a change-in-state in a predicate is useful for understanding the syntactic building blocks of a narrative, but is too granular for addressing narrative changes in a text for narratological analysis. Another highly promising system under development is *Yarn*, which uses Hierarchal Task Network (HTN) planning to generate visualizations of possible storylines [Padia et al. 2019]. Still, here too the plot composition is presently too crude to be able to meaningfully differentiate between narratives for the purposes of narratology.

Finally, there has been a spate of projects that use film as a basis of narrative analysis. As Eric Hoyt et al. explain, “[o]f all narrative forms, the motion picture screenplay may be the most perfectly pre-disposed for computational analysis” [Hoyt 2014]. This is because the text is already semi-structured with characters identified by dialogue and narrative units separated into scenes. Since the process of narrative analysis of scripts lends itself to automation, a number of

analogous projects have emerged independent of one another that generate a visualization of narrative progression over time. These include work done by Sharma and Rajamanickam [Sharma & Rajamanickam 2013], *ScripThreads* [Hoyt 2014], and *Story Curves* [Kim et al. 2018]. The underlying assumption with all of these projects is that the script scene sequence is consonant with the plot event sequence. From a strict narratological perspective this need not always be the case. Events can also be conveyed to the audience through diegetic and extradiegetic elements, as, for example, when a character reveals his or her backstory through dialogue with another character, or when there is a voice-over that relates past or future events. Presumably, these events occur at a different date than the chronological order of the scene. To account for this discrepancy in any automated parsing method adds a substantial level of complication. While this by no means invalidates such projects, it merely underscores that the question of the appropriate scale of a narrative event is still unsettled.

In sum, the twinned foundational challenges facing a more widespread adoption of computational narrative analysis are those of scale and scalability. The projects that rely on manual encoding are generally fine-grained enough to provide consistent narratological insight, but the labor involved does not scale well. Meanwhile, automated methods tend to be too course-grained to allow for meaningful comparison between texts, or, conversely, they provide analysis at the level of the predicate, which is not functional for narrative analysis. As Prince points out, “narratologists agree that narrative sequences represent linked series of situations and events and further agree that these sequences can be expanded or summarized, that they can be combined with other sequences in specifiable ways such as conjunction, embedding, or alternation, and that they can be extracted from larger sequences” [Prince 2016]. This type of narrative modularity can only be achieved if event units contain more than predicate-level information, and account for a unified ontology of space, time, and character within an event, while at the same time being more specific than a summary of the text. While there is no precise determination as to what this scale might be, the method developed for *DY* provides a flexible and reproducible framework.

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Punctuating the Long Sentence: Event-Driven Narrative Encoding in Faulkner

Faulkner Studies has always had a special relationship with narratology. Because Faulkner’s texts are so narratively intricate, one consistent topic of exploration has been dis-entangling his plot lines and understanding his use of time, so much so that it is somewhat of a cottage industry [Going 1958] [Harris 1993] [Inge 1970] [Nebeker 1971] [Perry 1979] [Reed 1974] [Schwab 1991] [Stewart & Backus 1958] [Volpe 2003] [Wilson 1972]. With the advent of digital technologies this exploration has continued unabated. John Padgett’s “William Faulkner on the Web” still provides a rich resource for Faulkner novices and experts alike [Padgett]. “The Sound and the Fury: a Hypertext Edition” by Stoicheff, Muri, Deshayé, et al. was a highly innovative project that tackled the problem of visualizing one of Faulkner’s most challenging narratives as early as 2003 [Stoicheff et al.]. Before *DY*, the most sophisticated visualization of a Faulkner narrative was actually the 2003 Adobe Flash-based chronology of *Absalom, Absalom!* created by current *DY* director, Stephen Railton [Railton & Rourke 2003].^[3]

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In its sheer openness and scale, *DY* supersedes these early Faulknerian projects, while simultaneously being heavily indebted to them. The data currently available represents nearly five-thousand character records, over two thousand locations, and more than eight thousand events, each with their own individual attributes. Aggregated, these data tables represent around a quarter-million data points across several dozen different data fields.^[4] This data drives the main interface, but can also be used to create alternative visualizations. For example, Raphael Alvarado designed a platform to generate force directed graphs that show the co-occurrence of characters and locations [Alvarado 2018].

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Included in this data set are also a number of variables that allow for the study of Faulkner’s narrative: chronology, narrative status, and event dates. In order to arrive at these more abstracted data points, all of Faulkner’s Yoknapatawpha fictions had to be entered into a relational database containing the entities: “Text,” “Locations,” “Characters,” and “Events.” “Texts” contains the individual “Locations” and “Characters” for that text, and “Events” are the combination of a character or characters at a location for a unified action.^[5] An overview is provided in the entity relationship diagram below (see Figure 1):

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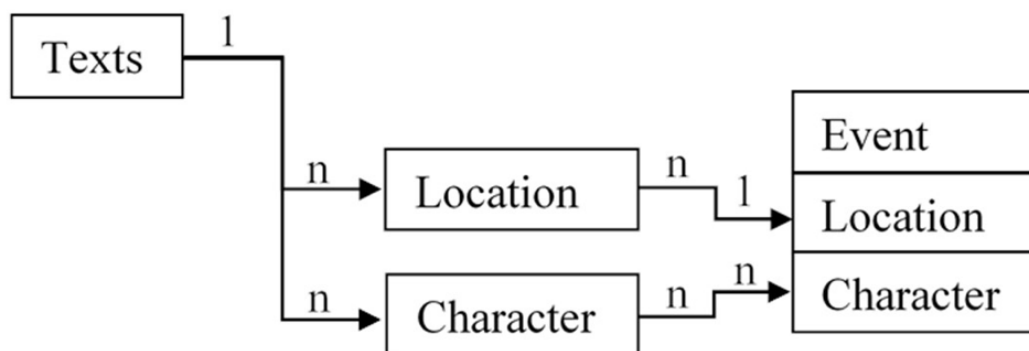


Figure 1. Entity Relationship Diagram Digital Yoknapatawpha Database
Entity Relationship Diagram
Digital Yoknapatawpha Database

While entering all the locations and characters has been by no means uncontentious, encoding events has presented some of the most difficult theoretical and practical challenges. Since a database can only store discrete information, delimiting events, which tend to be non-discrete, necessarily requires interpretation because the boundaries that separate beginnings and endings are unclear and subjective [Mani 2013]. In an ideal scenario, events are entered at the same level of granularity with the same consistency across the corpus. Impinging on this ideal are practical considerations. Digital projects that require manual encoding quickly run into limitations like data collection scope, the labor available, and the possibility of introducing human error. The slightest change in the definition of event boundaries can exponentially increase project completion time. An example is instructive here. Faulkner’s “Red Leaves,” is a short story about the ritualistic burial of Issetibbeha that requires a “hunt” of his body-servant who is to be buried next to him. In the following passage, the African American servant is returning to the burial site and along the way he comes across one of the Chickasaw:

[A](1) In the middle of the afternoon he came face to face with an Indian. (2) They were both on a footlog across a slough — the Negro gaunt, lean, hard, tireless and desperate; the Indian thick, soft-looking, the apparent embodiment of the ultimate and the supreme reluctance and inertia. (3) The Indian made no move, no sound; he stood on the log and (4) watched the Negro plunge into the slough and swim ashore and crash away into the undergrowth.
[B](5) Just before sunset he lay behind a down log [Faulkner 1995].

There are many ways to divide up the events in this text. The first is to say that the entire paragraph and the following sentence constitute an event because it starts in the middle of the afternoon and goes till sunset. This is a period of several hours, and should therefore be considered one extended event: the servant running away. The other option, [AB], uses the paragraph division to split the passage in two and considers [A], the meeting with the “Indian,” and [B], lying behind a log, as two different moments. The last option would be to divide every individual action and description into an event (1,2,3,4,5). This approach appears ideal from a data perspective, because it gives the greatest amount of detail. The drawback is that entering five different records is much more laborious than the first approach. Since, each event record requires the entry of thirteen variables, the difference is between entering thirteen or sixty-five data points. Scaled to the level of the text, a story that might take thirty hours to encode suddenly takes a hundred and fifty hours. As each story in the *DY* database is also peer-reviewed and subsequently curated for additional data entry, changing the scale also increases the labor required downstream in the production cycle.

For *DY*, the scale of an event is defined as, “1 setting, 1 unbroken length of time, 1 main focus and 1 narrative style is 1 continuous Event” [Railton et al. 2015]. This definition has remained remarkably durable throughout the production process. The narrative is capsulized into units that are intelligible as self-sufficient ontologies. An event can therefore be de-contextualized from the larger narrative, and still make sense as an action performed by a character or characters at a particular place. Needless to say, applying this definition consistently throughout the encoding process does not happen without debate. Usually, the bone of contention is whether an event remains one continuous action when a key character enters or exits a location, and how to break up events where characters are travelling for an indeterminate

amount of time and space. Notably, *DY*'s definition of an event uses page number as a proxy for discourse time (the amount of time it takes to read the passage) and does not measure story time, (the duration of the event in the text) [Chatman 1978]. An event may span several pages and describe an action that happens in an instant, or, conversely, may only be one sentence and take years. Thus, it is possible to show the order of events, but not the narrative pacing that dictates that order.

Along with delimiting events, another challenge is ordering them. For the purposes of the main visualization, the events need to be placed in chronological order. There are few literary texts that adhere to a strict chronological order, and Faulkner's are certainly not among these. This makes for great reading, but challenging encoding. Fortunately, while many of Faulkner's events are narrated out of order, they do follow an underlying total order [Richardson 2012].

This is not always the case though. There are occasionally "orphan" events that cannot be unambiguously slotted into a chronology. For example, in their meticulous chronological study of *The Sound and the Fury*, George Stewart and Joseph Backus document three, relatively minor, orphan events. In their opinion, "the matter is too minute to warrant further discussion" [Stewart & Backus 1958]. Though this may certainly be true of their research, it presents a significant database entry problem for *DY*. These events must be entered somewhere so they can be sequenced in the animation, and whatever position they are given changes the total order of the chronology.^[6]

On occasion, computation was used to provide a rough sort of events, but, by and large, the final chronologies for each text were ultimately the result of textual scholarship. It should be noted that sorting events through computation is possible, however; as Burg et al., have shown in their work using constraint logic programming to infer the most probable order of events for "A Rose for Emily" [Burg, Boyle, & Lang 2000].^[7] Unfortunately, computational sorting cannot account for any authorial irregularities in a plot. As Faulkner likely did not anticipate that his fiction would be manually encoded by a group of scholars for the purposes of visualization, he did not iron out plot timeline inconsistencies. Perhaps the most famous example of this is his work on *The Mansion*. For the final drafts of the novel, Faulkner was extremely reluctant to correct timeline discrepancies with his previous novels and adjust misalignments with historical events [Railton et al. 2015]. Any system that relies on causality and strict date ordering would run into trouble sorting this text.

Stepping back, it is clear that the *DY* data is the result of interpretation, collaboration, and compromise. Nevertheless, part of the success of the encoding process has been the intuitive ease of data entry achieved by framing the data within fundamental narratological concepts. Annotators with various levels of technical expertise could be onboarded and taught to encode by working on a short-story that was then checked for consistency. On average each text event coding went through seven passes. The initial pass of hand-coding the events in the paper copy of the text, transcription to a spreadsheet, sorting the events by chronology in a spreadsheet, entry into the database, peer-review by a fellow database editor, another review by the director or one of the associate directors, and another final review for inconsistencies before being brought online. This very intensive vetting process reduces the possibility of human error and inconsistency, but, of course, cannot guarantee its elimination. Importantly, one of the valuable lessons about the encoding process is that the data should only go live once all errors have been removed. Once an erroneous entry makes its way into the database it is very hard to discover and revise. Furthermore, as all the encoders were Faulkner scholars, there was a continuous temptation by editors to introduce ever more narrative features to capture the richness of Faulkner's writing. Needless to say, this would have meant continuously recoding eight thousand different entries representing six thousand pages of narrative text, significantly adding to the prospective workload. Such efforts were thus held in abeyance until the completion of the initial encoding of all the texts. Currently, the *DY* team is adding an additional level of nuance to each event by labelling each event with keywords. This process has greatly profited from the fact that the event structure is already in place.

Taking the narrative data and turning it into visualizations presents its own suite of challenges. There are no established conventions for representing digitally encoded narratives. Without standard practices, it is hard to interpret and compare different narrative data visualizations. In this regard, Faulkner's texts are particularly tricky to visualize because he experimented with narrative structures throughout his career. Scholars have described his complex narrative techniques as everything from the "frozen moment" to enclosure of past, present, and future [Rio-Jelliffe 2001] [Skei 1999].

Reflecting on his writing, Faulkner once famously conceived of the past and present as one long sentence:

There is no such thing really as was because the past is. It is a part of every man, every woman, and every moment. All of his and her ancestry, background, is all a part of himself and herself at any moment. And so a man, a character in a story at any moment of action is not just himself as he is then, he is all that made him, and the long sentence is an attempt to get his past and possibly his future into the instant in which he does something. [Faulkner 1965]

Faulkner's theory of the long sentence and the continuously present past, represents a fundamental complication for visualization. A faithful rendering of his vision would have to project the narrative past and the narrative present on top of one another, which would, at best, lead to an amorphous blob. On the other hand, showing events as a discreet sequence does not do justice to the way Faulkner weaves the past through the present in his work.

A related challenge is that Faulkner's idea of the past being eternally present led him to experiment with time throughout his career; arguably each of the novels is a reworking of the same theory in a different form. Ideally, a visualization that captures Faulkner's use of time has to be consistent across all his works to provide a basis for comparison, but also flexible enough to capture the idiosyncrasies of each text. For instance, the *Sound and the Fury* and *Absalom, Absalom!* are both about the past, but "[o]ne is a drama about knowing events, the other a drama of events defused and disconnected" [Labatt 2005]. These differences in the way time is constructed are compounded when expressed across the entire corpus. Any visualization of his narrative, including the ones provided by the narrative structure analysis dashboard, can only provide a provisional and limited insight into the texts.

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One final hurdle to visualizing narrative in Faulkner is that the unique narrative problems his texts present may not necessarily be useful for creating a shared visual language with other, non-Faulkner texts. This is an obstacle that narrative theory is particularly adept at surmounting. After all, there are certain generalizable textual aspects based on narrative theory that can elucidate cross-author comparison.

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Matchless Times: Visualizing Faulkner's Plots

At first blush, it would appear that there is no accepted standard for visualizing narrative data. This is only because the common means of doing this have been scattered across different knowledge domains. In fact, a number of different projects have proposed analogous models, even if they were not necessarily aware of one another. The most consistently used model relies on graphing the chronological order in relation to story time. This technique was already anticipated by Vladimir Propp, and he hints at versions of the models in the appendix of *Morphology of the Folktale* in 1928 [Propp 1979]. Earlier work by Faulkner scholars has also adopted the same technique of contrasting plot with story [Railton & Rourke 2003] [Stoicheff et al.]. The storyline models created by Randall Munroe on xkcd.com have inspired much productive subsequent research [Liu et al. 2013] [Munroe 2009] [Padia et al. 2019] [Tanahashi & Ma 2012], and are similar to Propp's initial insights, even if he is not mentioned. Thus, when Kim et al. claim that their project Story Curve is the "first scientific investigation and systematic exploration of this visualization technique," it is perhaps somewhat overstated [Kim et al. 2018]. The deep parallels between current work and that of Propp nearly a century earlier should not be seen as evidence of stagnation within in the field, but rather as a testament to the intuitive power of this type of visualization design.

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Respecting this observation, I used the plotly.js graphing library and vanilla JS to design a data dashboard that would allow users ranging from first-time readers of Faulkner to seasoned scholars to compare his texts with one another on the basis of plot shape. As *DY* caters to the broadest possible audience, users have different levels of technical proficiency, and the usability of the charts needed to be immediate and intuitive. The design goal was therefore to create something that required very little input from the user, and generated insights that would be familiar and meaningful to literary scholars. The resulting interface allows users to compare up to four charts, and toggle between chronological order and date range. The charts also have some functionality that is native to plotly.js that enables a more scoped view of the data, and the ability to download the chart. Along with the main narrative structure chart, there are also charts showing the percentage of different forms of narration; the ratio of flashbacks, flashforwards, and linear event sequences; and a frequency diagram of events across the dates of the story. The various tools all work together to allow

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Understanding Chronology through Plot Shape

The step charts below represent the progression of the story relative to the order in which it is told. They are meant to showcase the plot structure of a text in one, easy to compare, view. Each line segment represents one event. Events that comprised less than a page come across as a dot, while events that amounted to multiple pages are line segments, though for novels most line segments appear as dots due to scaling. The length of events only captures their discourse time, and does not correspond to their significance or textual duration. These segments are plotted by page number on the x-axis and chronological order on the y-axis.^[8] When events happen earlier, they are lower down. Conversely, events that happen later in the chronology are higher up on the chart. If the story and the plot coincide, and events are told in the order that they happen, the slope is forty-five degrees. This is rarely the case for Faulkner, or any author. Instead, there are usually troughs or peaks in the line. These are indications of analepsis (flashback) or prolepsis (flashforward), respectively.^[9] Borrowing from an example by David Herman, if story and plot coincide, the order of events plotted out as a line segment is ABC (see Figure 2). If Faulkner tells the story in a different order and uses a flashback, the order is BAC. Visually, line segment A will come sequentially after B on the x-axis, but appear lower down on the y-axis (see Figure 3). In that same vein, if there were a flashforward the story would be told ACB and segment C would precede B on the x-axis, but be higher up on the y-axis (see Figure 4) [Herman 2002].

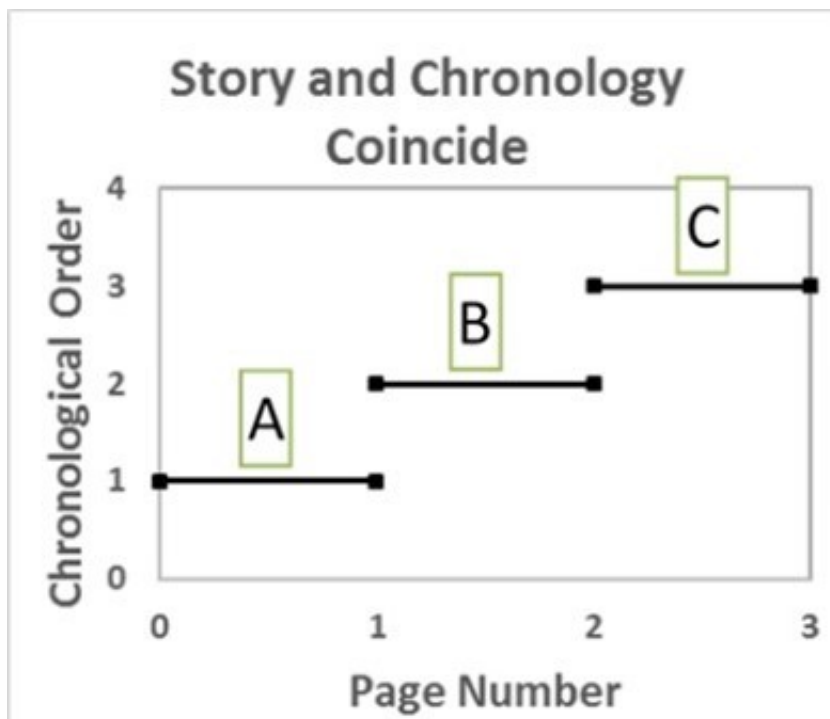


Figure 2. Story and Chronology

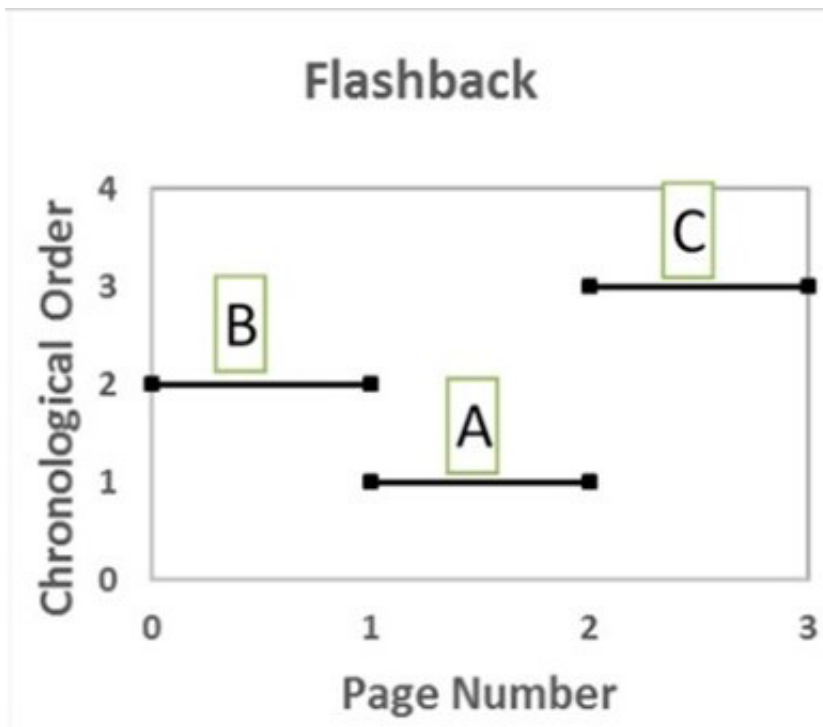


Figure 3. Flashback

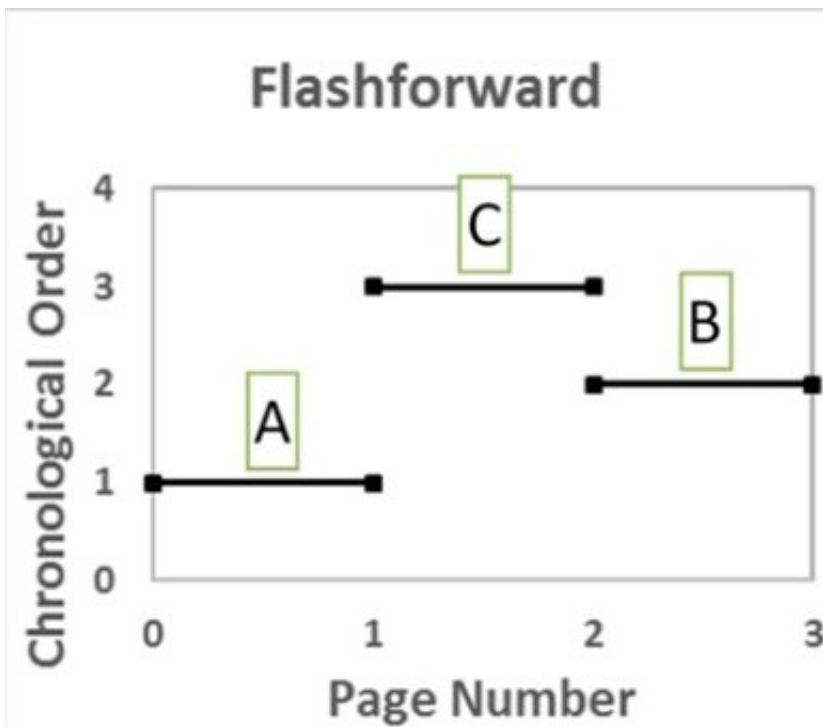


Figure 4. Flashforward

Along with chronological data, *DY* also identifies the narrative status of an event. Narrative status answers the question: “Who/what is responsible as the source of this Event?” [Railton et al. 2015]. This concept does not map neatly onto any language available in narrative theory, and using any adjacent definition likely leads to more confusion than clarity. Be that as it may, each event is identified as having one of five narrative statuses: 1) *Narrated* by a first or third person narrator; 2) *Told* by a character in the story; 3) *Remembered* through a character’s consciousness; 4) *Hypothesized* when something might have happened; 5) *Narrated+consciousness* when Faulkner combines narration with stream of

consciousness. The last case was created specifically for *Light in August*, though examples appear sporadically throughout other texts. Using these categories, the chronological data can be subsetting according to narrative status. Encoding narrative status for a text is not a necessary component for creating storyline charts, and the applicability of the narrative categories beyond Faulkner remains to be seen. It would be challenging, for example, to encode James Joyce's *Ulysses* with purely these type of narrative status classifiers. Nonetheless, the resulting visualization shows events as both a change in location or character, and as a change in narrative status (Figure 5).

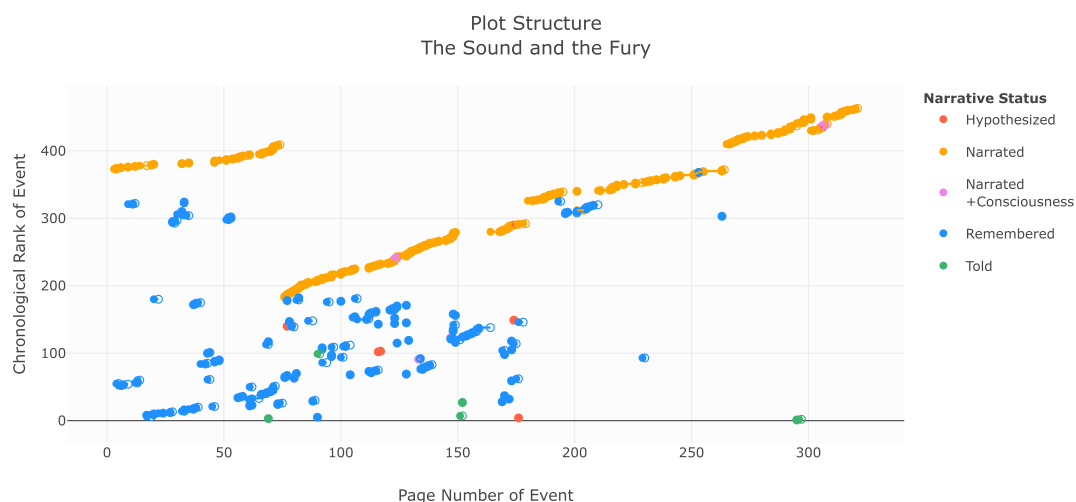


Figure 5. Events in *The Sound and the Fury* by chronological order and page number.

The above visualization compresses a lot of complex information. On the y-axis is the rank order of chronological events, and on the x-axis are the page and event number. The plotly.js library allows users several ways to drill down and manipulate the data. The legend is interactive and users can hide and show the various traces. Users can also hover over points to reveal specific information like rank, page and event number accompanied by the first 6-8 words of the event.

In this particular view of the *Sound and the Fury* several salient features of the text are visible. First, Benjy's chapter is the first in the novel, but is actually meant to be third sequentially. This is clear visually because the first series of yellow dots up until page 74 can be slotted into the space on the y-axis between 264 and 265. This is not particularly revelatory since the chapter titles are dated, but it does confirm that the sequence is in the right order. Second, many of the details in the narrative present are actually quite regular in their sequence, it is the past that appears confused and is frequently nonlinear. Upon closer inspection, even here there are patterns in the sequence. In terms of narrative status, it is interesting to note just how much of the *Sound and the Fury* is told through memory. The first two chapters are recounted to a large extent through the memories Benjy and Quentin have. Meanwhile, in the last two chapters the event sequence is far more linear, and the narrative status is more consistently narrated than the previous two sections. The novel appears to move from chaos and disorder to order and stability, and it is perhaps all the more poetic that the novel ends with "each in its ordered place" [Faulkner 1990].

Interpreting Temporal Positioning through Date Range

Along with chronology and narrative status, the date range during which events occur is another insightful way to visualize these stories. What is particularly revealing about the date information is how Faulkner structured the past in his narratives. At times, this is very precisely defined, as with the date titles of the chapters in *The Sound and the Fury*. In other instances, time is very vaguely indicated. The DY team enters an exact date whenever possible, but resorts to a date range when there is insufficient information for a specific date. Sometimes the range is a week, a month, or even a couple of years. In order to identify and delimit date ranges as much as possible, textual references to real historical events, such as the Louisiana Purchase or the Battle of First Manassas, are used as anchors to which other relative

dates are tethered. Even this is not always possible, since relative time indications like “earlier” and “later” have no specific value. In such cases, it is indicated that the date range is indeterminate.

The aforementioned challenges with establishing the dates for events notwithstanding, it is still possible to visualize them in a productive manner. The graph below shows the latest possible date for each event indicated by a red line and the earliest possible date with a blue line (see Figure 6). The area in between represents the range of dates possible. As opposed to the chronological graphs, these have a continuous line because it provides more visual clarity than a segmented line, even if it might give the false impression that there is a smooth transition between past and present.

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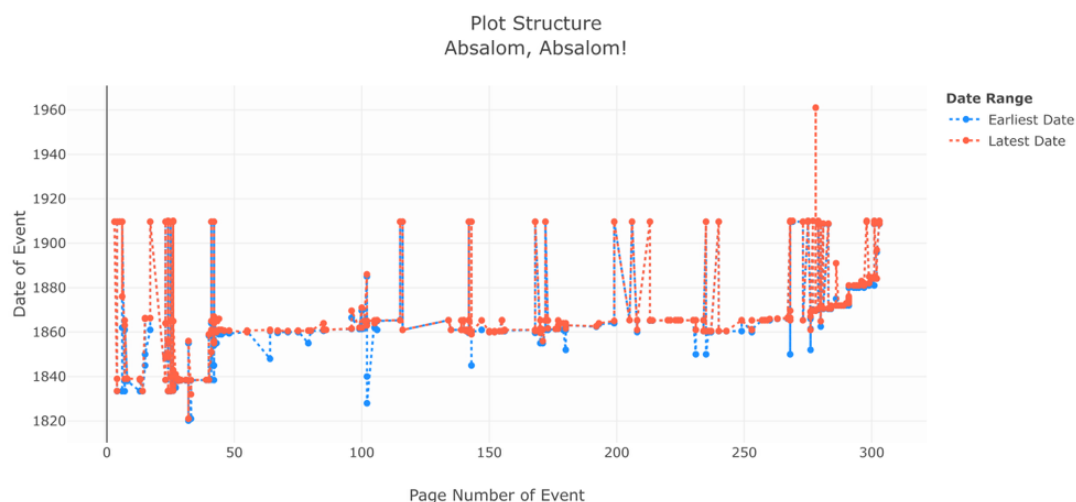


Figure 6. Events in *Absalom, Absalom!* by date range and page number.

To a certain extent, the date range graphs parallel the chronology graphs, because both order the events relative to page number. The key distinction is that the date range charts demonstrate the difference in time between events. The chronological graphs are insightful with regard to the sequencing of time; the date range graphs give a better sense of how Faulkner is using historical time.

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In the chart of *Absalom, Absalom!* this use of the past is particularly powerful. Even though the narrative present is 1909-1910, many of the events take place at an earlier date. Looking across the graph, it is possible to see that the past predominates the beginning of the novel, but over the course of the text the past and present grow together, until, finally, they almost intertwine at the end. The chart demonstrates just how closely interknit past and present are in Faulkner’s imagining.

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Conclusion

While it is tempting to make inferences about Faulkner’s work using the narrative structure analysis dashboard, those conclusions have been deliberately forestalled here. Instead, the goal of *DY* is to provide a platform for other scholars to use the data for their own work. It makes little sense to create a dynamic user-driven visualization if it is only meant to lead to predetermined answers. That being said, there are a number of fruitful areas of investigation that the dashboard makes possible. The first of these is to see if there is a pattern in the way Faulkner structures the plots of his texts. One of Faulkner’s central concerns is how the past inhabits the present, but it is unclear if he does so in continuously new ways or if there is a signature “Faulknerian style” with which he works and reworks this material. A related issue is the change or consistency in his use of chronology, narrative status, and date ranges throughout his career. In Faulkner studies, there is a generally accepted arc of Faulkner’s development that divides his literary output into several distinct periods. It would be interesting to see if this structured division of his writing is visible in the visualizations or if these tell a different story.

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Beyond Faulkner, the visual language used in this paper and the accompanying dashboard are prompts for a larger discussion about representing and interpreting digitally encoded narratives. The framework for narrative analysis provided by *DY* is precise enough to highlight meaningful differences, while being broad enough not to be limited to Faulkner. The visual language used for the dashboard is similar to projects within disparate knowledge domains, suggesting their intelligibility. A broader adoption of plot/story charts would usher in the ability to start comparing different authors on reasonably equal narratological footing. One obvious point of contrast for Faulkner is a contemporaneous author like Ernest Hemingway, many of whose short stories take place almost entirely in the narrative present. Yet, the trauma of the past is always lurking just under the surface about to explode. Similarly, it would be interesting to compare Faulkner's writing to that of realist authors like Kate Chopin, who more strictly adheres to the conventions of chronological unity.

Whatever path researchers might strike out, narrative theory still provides an indispensable map for conceptualizing, and encoding narrative data. No doubt, this encoding is an artificial construct that does not reveal any type of fundamental truth about a text, as early structuralist narrative theorists might have imagined. Nevertheless, these rasters for interpretation slice up texts in unexpected ways, providing new insights yet to be imagined, much less visualized.

Notes

[1] Of these, the classic work is Gérard Genette's *Discourse du récit*, which has been productively mined by literary scholars and computer scientists for his insights into narrative. For an overview of a semantic analysis see: [Frawley 1992]. Blair Labatt uses event salience for a narratological analysis specifically based on Faulkner's work [Labatt 2005]. Joseph Reed's work is an early attempt at using narrative theory to analyze Faulkner. It is somewhat idiosyncratic in its outlook though [Reed 1973]. James Phelan and Peter J. Rabinowitz's critical introduction to narrative theory provides an excellent overview of rhetorical, feminist, mind-oriented, and antimimetic approaches with regard to time, plot, and progression [Herman 2012]. Other definitions include Leitch, who sees plot as a function of the a teleological principle [Leitch 1986].

[2] Finlayson's more recent related work is extremely promising in its potential to parse sub-events from narratives [Aldawsari et al. 2019].

[3] Unfortunately, neither digital text currently functions. Due to copyright issues the full hypertext created by Stoicheff, Muri, Deshayé, et al. is no longer available. Though it is still a good resource for digital renderings of the text. In fact, a graph created by Kathleen Murphy of narrative time in the Benjy section of *Sound and the Fury* shares many similarities with the chronology graphs this paper presents [Murphy 2003]. Likewise, the chronology of *Absalom, Absalom!* created by Railton and Rourke no longer functions because it was coded in Flash. Currently, attempts are being made to revive the chronology in a new format.

[4] As of this writing the exact numbers are 2,152 locations, 4,988 characters, and 8,435 events, though these are always subject to change.

[5] The database also contains a location key that keeps track of all the locations being used across the corpus, but this does not have any bearing on the research here.

[6] This approach precludes the possibility of simultaneity, something that other storyline visualizations are able to do.

[7] Their findings are intriguing as a proof of concept for constraint logic programming, though they readily admit that perhaps "to understand Emily, we must give up our orderly sorting of experience." That is to say, that the "fuzzy" dating of the text may not be a puzzle to be solved but a confusion to be experienced. After all, it seems unlikely that Faulkner hid within his story an obscure dating and chronological system that he wanted to be discovered through an advanced programming language seventy years later.

[8] The reason for choosing page number, which is dependent on edition, versus word count, which is independent of layout and more precise, was a practical one. Only in some cases was there a clean digital version available. In the future, this data will eventually have to be linked to word count as well as page number.

[9] Nonlinear sequencing is not always a sign of prolepsis or analepsis can also be a sign of event parallelism. Since the events have to be entered in rank order, events that happen at the same time are forced into a linear sequence.

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