Patterns of Sculptural Hypertext in Location Based Narratives

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ABSTRACT

Location based narratives are an emerging form of digital storytelling that use location technologies to trigger content on smart devices according to a user's location. In previous work on the Canyons, Deltas and Plains (CDP) model we argued that they are best considered as a form of sculptural hypertext, but sculptural hypertext is a relatively unexplored medium with few examples, and limited critical theory. This means that there is little guidance for authors on what is possible with the medium, and no common authoring tools, both of which impede adoption and experimentation. In this paper we describe our work to tackle this problem by working with creative writing students to create 40 location based sculptural hypertexts using an approach similar to paper-prototyping, and then analysing these for common patterns (structures of nodes, rules, and conditions used for a poetic purpose). We present seven key patterns: Parallel Threads, Gating, Concurrent Nodes, Alternative Nodes, Foldbacks, Phasing, and Unlocking. In doing so we see some overlap with the patterns identified in traditional (calligraphic) hypertext, but in many cases these patterns are particularly suited to sculptural hypertext, and hint at a different poetics for the form. Our findings refine our original CDP model, but also present a starting point for educating writers on how to approach sculptural stories, and form a foundation for future location-based authoring tools.

Categories and Subject Descriptors

H.1 [**Models and Principles**]: General

General Terms

Human Factors, Standardization, Theory

Keywords

Narrative, Narrative Systems, Location Based Narrative, Mobile Narrative

1. INTRODUCTION

The increasing availability of location-aware smart devices, particularly smartphones, has led in recent years to experimental forms of context-aware entertainment. One such form is Location Based Narrative - a type of dynamic storytelling where content is triggered by location. Location based narratives have been studied by the research community for some time but focus has mostly been on individual bespoke location aware systems, typically developed and supported by a dedicated research team, and outside the reach of much of the creative community. However, many of these systems have commonalities, and a better understanding of the core patterns and uses of location-based narratives could potentially lead to standard platforms and expectations, unlocking the form for a wider variety of writers.

Towards this goal in 2013 we published a general model of location based narrative [19] which identified three high level structures which we called Canyons, Deltas, and Plains (CDP), when used individually, or when combined, these structures could be used to express the structural forms of existing systems. We then showed that a general Sculptural Hypertext model could be used to build all of these CDP forms, including the hybrid ones.

While the sculptural hypertext model is a powerful one it is very low level (we doubted that authors would think about their stories in the form of multi-dimensional states and state transitions), so we also suggested a number of mid-level structures that would make more sense to authors, these included chapters, stacks and timers. These were inspired by our earlier work on sculptural hypertext [7] but we had no way of knowing if these were the most useful mid-level structures for authors.

A better term for these mid-level structures is *Patterns*. Bernstein's key 1998 paper analysed some of the patterns that he had observed in traditional node/link hypertext [5] (sometimes called Calligraphic in contrast to Sculptural) but no similar work has been done on sculptural hypertext, probably due to the scarcity of examples, and the lack of common format. This is a circular problem that affects new forms of hypertext [15], as without a clear idea of the sorts of patterns that authors want to employ it is difficult to design effective authoring tools, and without effective authoring tools there is no method by which to create example works, and thus analyse patterns.

In this paper we attempt to tackle this problem, and build on our CDP model to define a number of sculptural patterns that could be used to support authors of location-based narratives.

To achieve this we took a paper-based prototyping approach, and as part of the StoryPlaces project worked with 40 creative writing students to have them each create a short location aware narrative for us based around a common location (in this case the old town area of Southampton, UK). We were then able to perform a structural analysis of the resulting stories, in order to identify common patterns and the ways in which they were used.

Our goal is to bootstrap the understanding of location based narrative, and work towards authoring tools that are aware of the common goals of location-based narrative authors. While we do not claim to have an exhaustive set of patterns for sculptural hypertext, there are echoes of Bernstein's calligraphic patterns and the mid-level structures of CDP, and we believe that this initial analysis does move beyond our original CDP model to a more mature understanding of location based narrative.

2. BACKGROUND

Our work draws on two principle existing areas: Location Based Narrative systems, being the application space, and Sculptural Hypertext, being part of our solution to the problem and relevant to our structural analysis.

2.1 Sculptural Hypertext

Sculptural hypertext is an approach to hypermedia where by structure is created through the removal (or blocking) of links between nodes rather than their creation [6][28]. In his work on Card Shark and Thespis [6] Bernstein describes his systems as "sculptural" because of the way all nodes are linked together, but these links are then prohibited by rules and constraints (such as the requirement that a different node be visited first) sculpting away the links into an eventual structure. In contrast he describes the more traditional hypertext where nodes are unconnected and links are then explicitly added as "calligraphic".

Sculptural hypertext lends itself to broad open narratives with a high degree of potential interconnectivity as only the restrictions must be defined, not the connections, in contrast calligraphic hypertext lends itself to more controlled linear experiences where the number of possible connections is smaller. Referencing his earlier patterns of hypertext [5] Bernstein points out that "The tangle, not the link" is the primitive in sculptural hypertext. Location based narrative, with its common focus on open narratives encouraging exploration is a natural fit for sculptural hypertext, where the locations are modelled as additional constraints on nodes,

and the requirement to construct links for all possible reading patterns and routes is avoided. A number of existing location aware systems discussed in the following section such as Chawton House [27][26], and the Ambient Wood [24] use a sculptural engine to support them, and the rule based structures of other systems such as Riot! [8] and San Servolo [23] also echo the sculptural approach of defining what is not linked, as supposed to what is linked.

2.2 Location Based Narrative

A range of bespoke location based narrative systems have been built, both within and outside the Hypertext research community. These systems employ subtly different structures and technologies, but can be best classified by their application. We divide existing systems into *Tour Guides*, *Educational Tools*, *Location Aware Fiction*, *Location Aware Games*. While some fall outside this (such as the Geo-Spatial Hypermedia information systems by Grønbæk [14][13]), the majority fall within these four types.

2.2.1 Tour Guides

A common application of location based narrative is within location aware tour guides, which seek to inform and engage their audience in their surroundings, often accompanied by a historical narrative. These guides can take both an open form (encouraging the user to explore), or a linear structure guiding the user through exhibits.

Typical of this are the Louvre tour developed within the HIPS system [9] and REXplorer [3]. HIPS is designed to allow for a range of location aware tour guides that are also connected to knowledge bases, and while this is demonstrated with a more open guide more structured guides are also possible. REXplorer is more tightly suited to structured tours, taking a more playful, almost game-like approach to tour guides, and encouraging the collection of artefacts throughout the tour.

There is a broad range of bespoke location aware tour guides that have been used to explore the field. Riot! [8] employs an open narrative structure where visitors to Queen's Square in Bristol were invited to listen to a location sensitive interactive play about a famous riot during their visit. The open structure encouraged the users to explore the area playing sounds clips contains parts of the narrative as they entered relevant areas. The work by Nisi on HopStory [22], and The Media Portrait of the Liberties [21] also explores a range of different ways of presenting location aware tour guides. HopStory, a linear dramatized brewery guide, includes the exploration of time based narratives similar to that of Riot!, where nodes are only accessible within a given time frame. Media Portrait is by contrast an combination of both open and linear narratives exploring stories contributed by people living in an area of Dublin, and distributed to immerse visitors in the culture of that space. Its combination of two different types of high level structure (open and linear) is typical of a great many systems, and an important part of our Canyons, Deltas, and Plains model.

2.2.2 Educational Tools

While location aware guides could be considered educational, some location based applications focus more carefully on the educational process of learning rather than just exploring a space. These include interactive educational tools such as Gaius' Day in Egnathia [2] and 'edutainment' sys-

tems such as Geist [18].

Location aware educational tools are also well represented in sculptural hypertext. The Ambient Wood project [24] utilises a card and deck metaphor for children exploring educational nodes in a wood. The users are encouraged to collect artefacts while participating (similar to the way REXplorer and HopStory do) and engage in multimedia educational activities using a range of sensors. Similarly the Chawton House project [27][26] adopts a similar card based approach to support an educational experience for children set around a period home, but with more interactive cards and a more structured direction of participants around the space.

2.2.3   Location Aware Games

Location aware games is a broad classification that includes systems with game mechanics connected to player context as well as augmented reality experiences such as Can You See Me Now? [4], Viking Ghost Hunt [20], TimeWarp [16], or University of Death [10]. Can You See Me Now? makes use of a mapping between a players real and virtual locations as part of an exciting chase between participants. Viking Ghost Hunt and TimeWarp take a more visual augmented reality approach to hunting ghosts and HeinzelmÍannchen of Cologne (small virtual elves) respectively - leading players on a branching trail of clues and narratives and using interactive mini games and camera overlays to allow the player to achieve their objectives.

2.2.4   Location Aware Fiction

Location Aware Fiction can be used to increase the immersion of a reader within a story setting. While the distinction between these and both tour guides, and games, can be blurred at times the important defining feature here is the focus on delivering an engaging story, as supposed to location description or interactive play. The iLand of Madeira exposes an oral history of the island of Madeira through an open narrative of content tied to locations, not unlike Riot! as discussed previously [12]. Similarly "San Servolo, travel into the memory of an island"[23] is a location aware work of fiction set around an island based sanatorium. Pittarello's narrative framework for San Servolo is based on earlier work on machine readable models of narrative carried about by Carnielli [11], and focuses of the delivery of "situations" based on a variety of contextual checks. These "situations" are sections of textual narrative shown to user based on the decisions of an intelligent director agent that assess suitability of the content based on contextual data recorded on the user as they travel the island such as location, weather, and content previously read.

3.   MODELLING LOCATION BASED NARRATIVE

In our work on Canyons, Deltas, and Plains (CDP) [19] we explored a general model of location based narrative that could be supported by an underlying sculptural hypertext engine. Our CDP model proposed that location based narratives such as the ones described above could be described in terms of Canyons, Deltas, and Plains - representing Linear, Branching, and Open narratives respectively. Linear narratives being an ordered sequence of nodes, branching narratives being those where the sequence of nodes diverged
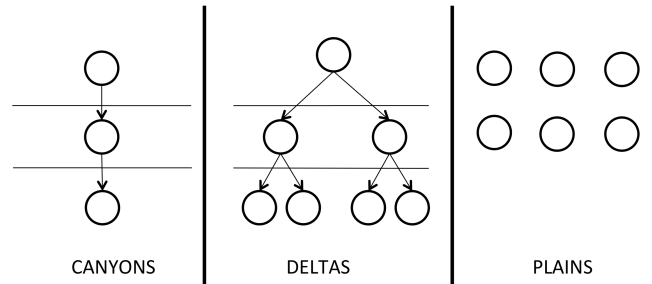

Figure 1: Nodes arranged in Canyons (Linear), Deltas (Branching), and Plains (Open) structures. As presented in [19]

and split based on reader interaction (which could be simply choosing a direction to physically move), and open narratives being a collection of nodes that could be explored in any order. These structures are presented in figure 1. A location based narrative could be built of a composite of these structures to create a hybrid of different structures - it might start as a linear narrative but later branch, or begin as an open story that leads to a number of different discoverable linear narratives. We showed that this was sufficient to model a number of different location based narrative examples from the literature.

Key to the CDP model was the realisation that location based narratives were better considered as sculptural rather than calligraphic. This is because location can be modelled as part of the user's state, and in sculptural hypertext it is state changes, rather than explicit link following, that move a reader through the hypertext.

We suggested a number of mid-level structures that could be built on top of a sculptural hypertext engine to make things easier for authors: nodes that could be pinned to locations, chapters that gather nodes that are concurrently available (subject to location changes), transitions between chapters (triggered by reading specific nodes), timers that trigger transitions, and stacks that provide an easy way of creating a simple sequence. Through these mid-level structures the higher level structures of canyons, deltas, and plains could emerge. Figure 2 depicts how a combination of these mid-level structures can be used to build canyons, deltas, plains, or a hybrid combination of more than one.

4.   METHODOLOGY

The StoryPlaces project aims to build a framework for understanding the poetics of location based narrative that can support critical analysis, author education, and lead to improved authoring systems. To achieve this the project has adopted a co-design approach where we work directly with both writers and literary experts in three consecutive story projects to develop both our models and systems, and our understanding of location based narrative as a form. This paper reports the work of the first story project to investigate the sorts of stories that authors might create, and identify the sculptural patterns that emerge. The intention being that this understanding can support writers in the later story projects, and lead directly to better authoring tools.

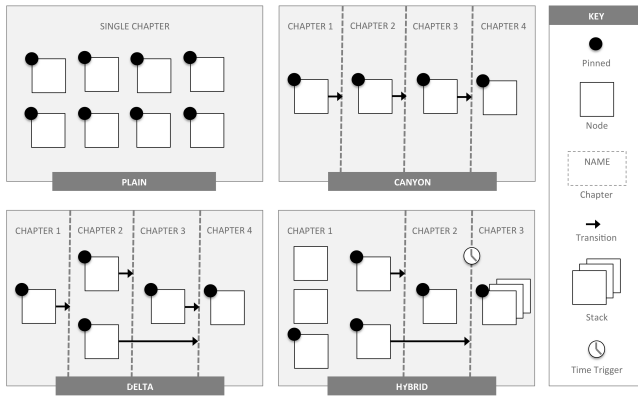This investigation requires us to observe a broader range

Figure 2: Canyons, Deltas, Plains, and Hybrids may be constructed out of nodes, chapters, and transitions. As presented in [19].

of stories then those we sampled from the literature in our work on CDP. It also requires writers working with real purpose, as the patterns are not just structural, but also poetic, in the sense that they are used for particular poetic purpose within the stories, and this is an important part of the description of the pattern. The difficulty is that there is no large group of authors working with sculptural hypertext, location-based or not, and thus finding a suitable set of rich stories is challenging.

To address this as part of the first story project (set in the old town of Southampton) we approached a group of creative writing students on a higher education course about writing and place, and for their assessment asked them to create location based narrative using an approach inspired by paper prototyping. The students all had experience with writing, but didn't have particular experience with writing hypertext, meaning that they had no pre-conceptions of what sculptural or location based narratives should be, but also that they needed some guidance on what was possible. The students were therefore given an introductory explanation of location aware narratives and introduced to short overviews of a few examples[1] in order to give them an appreciation of the sorts of things that were possible.

We were very conscious in this stage that by providing explanation and examples we might lead the students, but previous experience has shown that without basic training in a new form authors resort to simplistic and safe approaches that do not best show what is possible [15]. Thus our approach here is similar to that found in participatory and co-design [25], where domain experts (in this case the authors) are brought into a conversation about what they want to achieve, and how the technology might enable it, without dictating to them what should be done.

Using a paper prototype supported this approach as we could allow authors to express their ideas freely, without the constraints of a digital authoring system, in the end we used a digital document format (Microsoft Word) rather than paper, as the students preferred to write digitally and were able to submit their stories remotely. However, the core principles of paper prototyping remained: that the authors were

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[1]Examples were HopStory [22], San Servolo [23], The Chawton House Project [26], Viking Ghost Hunt [20], and Riot![8]

able to construct the content and the associated rules and locations, but with minimal restrictions, to avoid preventing the authors from creating something we might not have anticipated.

Consequently, we provided the students with a Word document in the shape of a simple form, in which they could write their annotated story - the form had three columns: a large one for content, and two smaller ones for locations and rules. We did not separate the form into rows for nodes, but allowed students to indicate this however they wished (typically with whitespace). This way the authors could write their stories but also annotate the content with location restrictions and story logic throughout as they saw fit. The students were also encouraged to "write over" the form if they wished to annotate or explain something that didn't fit the form. In order to foster stories of appropriate size and complexity they were also given guidelines that individual story nodes should be less than 200 words (to account for the common mobile delivery platform of location aware narratives) and that they should aim for a total story length of at least 2000 words.

5. RESULTS AND ANALYSIS

In total the study had 40 participants, each submitting a location aware narrative in the annotated format specified (an example of which is depicted in figure 3) and with a broad range of structures, location types, features, and genres. Figure 4 depicts a Venn diagram of the frequencies of different CDP structures and hybrids of multiple structures; authors more commonly wrote open or linear stories but there were also a range of hybrid structures that included branching. Our authors used a range of locations, mostly local around the city of Southampton in the UK (although one global story was written), and stories evenly ranged from using a small tight area that could be traversed with less than 15 minutes walking to large distributed stories that would involve multiple hours walking to finish. The majority of locations were outside (however three stories made use of inside locations), and there was a broad variety of locations used including residential, commercial, waterfront, entertainment, and religious spaces - with a slight preference for public and historical spaces such as parks and monuments. The genre of the stories varied widely, but dramatized tour guides, thrillers, and historical dramas accounted for a large number of the pieces. Our story set had an average length of 2311 words, and were made up of an average of 11 story nodes (range 4-19), roughly in line with the guidelines we had set out.

The stories created by the authors demonstrate the structures identified in our original CDP model, however the purpose of the exercise was to explore the mid-level structures, or patterns, that the authors used in their work.

In 1998 Bernstein wrote about the "Patterns of Hypertext" [5] that he had observed in the key hypertext literature of the time: Cycle, Counterpoint, Mirrorworld, Tangle, Sieve, Montage, Split/Join, Missing Link, and Feint. A key question for our analysis was whether we would see similar patterns emerge (but expressed in terms of sculptural state changes rather than links) or whether there are different sculptural patterns altogether.

Location	Content	Conditions
Avenue Campus	Just a quick detour – heading right onto Highfield Lane, up that all the way until you get to Lover's Lane (the reader is advised to maybe avoid this road at night – also to keep an eye out for militant cyclists). From there, it should be pretty clear when you've arrived at Avenue (there'll be nice big signs, and also it looks like the picture). After looking around a bit, maybe having some lunch at the café, if you're so inclined, and deciding that all in all it's much better than Highfield, it's time to turn around and head on down to Page Five. But, before you go…	Have to have read Pages Two-Point-Five, Three, and Three-Point-Five
	Page Four	

Page Four-Point-Five		
Location	Content	Conditions
Anywhere	Having stumbled out of a lecture, caught in the stream of people headed for various doors, you're momentarily bewildered. The *thing* you were supposed to do has dropped out of your head, and it's tempting just to leave it where it is and carry on regardless. You catch yourself, though, and turn your head casually (or, rather, with more effort than pretty much anything you've ever done to date)	Have to have read Page Four, and all the previous Point-Five pages

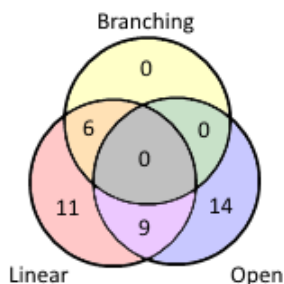**Figure 3: An example screenshot from a submitted story showing the annotated narrative.**

Figure 4: A Venn diagram of the frequencies of CDP structures and hybrids observed in our story set.

5.1 Patterns of Sculptural Hypertext

We manually analysed each of the submitted stories, looking for common structures and mechanisms. In total we identified seven patterns: Parallel Threads, Concurrent Nodes, Alternative Nodes, Foldbacks, Phasing, Unlocking, and Gating. As previously described these patterns exist within the greater CDP structures, and form a middle layer between these and the underlying sculptural hypertext engine, this is depicted in Figure 5.

5.1.1 Parallel Threads

Parallel Threads allow for stories with parallel subplots that may progress at different rates depending on the actions of the reader (at any time a node is available from each thread, and by activating that node by visiting its location the reader moves that particular subplot forward). Figure 6 shows this pattern. In this diagram (and the subsequent
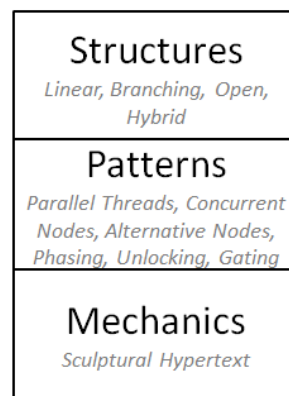

Figure 5: Patterns of authorship between higher CDP structures and the sculptural engine.
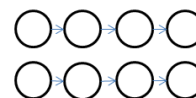

Figure 6: Parallel Threads

diagrams in this section) content nodes are shown as circles, and prerequisites are shown as arrows between nodes. A node only becomes available once its prerequisite has been activated, and only activate themselves once the reader visits the location associated with that node.

Parallel Threads enable a reader to jump back and forth between the two threads in a way that is not dissimilar to Bernstein's Counterpoint pattern, but unlike calligraphic hypertext the threads are independent and it is equally possible that a reader could read one thread entirely before another. The examples of Parallel Threads we saw in our stories were all of the form of 2 or 3 parallel linear threads, but in principle any number of linear or branching threads could be involved in the pattern.

Parallel Threads are introduced in one of two different ways. In an *open introduction* each of the threads is available from the outset. Alternatively some stories demonstrate a *staged release* where there is at first only a single thread and then more threads become available as the story progresses.
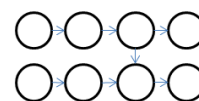
5.1.2 Gating

Figure 7: Gating

Gating (shown in Figure 7) represents a sub pattern of Parallel Threads and is related to staged release. Gating occurs where parallel threads are present, but there are dependencies between those threads meaning that the reader must reach a particular stage in one of the threads, before the next node in the other thread becomes available (this manifests as a requirement on a node within one thread for the reader to have previously visited a particular node in

another thread). Staged release can thus be seen as a kind of simplistic gating, where a second thread only starts once the first has reached a particular point. Gating allows the author to control the freedom of the reader and ensure that they catch up with a particular thread, potentially to ensure certain characters have been introduced or certain events have transpired, before progressing further in another. It is therefore a mechanism that brings the parallel threads patterns closer to calligraphic counterpoints, which manage the same problem through link structures.
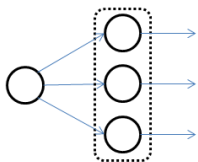
5.1.3 Concurrent Nodes

Figure 8: Concurrent Nodes

The sculptural structure of our location aware stories means that it is possible for more than one node to be active at the same time, a pattern we call Concurrent Nodes (shown in Figure 8, where a dotted lines surrounds the nodes that appear concurrently). How this is handled from a presentational perspective is down to the interpretation of client software, the nodes available may be summarised for a user to select, or they might be presented side by side (in which case they are analogous to Bernstein's Montage pattern). The creation of concurrent nodes in location aware sculptural hypertext must consider two types of restriction in that the nodes must satisfy both narrative rules (such as the prerequisite to have visited a given node) but also be collocated in a given location (to be read in the same place). We had anticipated that this would make Concurrent Nodes rarer in location based narrative than other forms of sculptural hypertext (where collocation is not necessarily a restriction), but multiple examples were found within our set of stories.
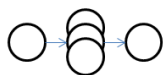
5.1.4 Alternative Nodes

Figure 9: Alternative Nodes

Alternative nodes (shown in Figure 9, where overlapping nodes are the alternatives) are when a set of nodes are available in a particular point in the story but rather then appearing concurrently they account for each of the possibilities of a particular state check. For example there might be one that is valid on a Saturday, another on a Sunday, and another on any other day. Alternative nodes were often used in conjunction with contextual conditions such as those based on time, weather, or other aspects outside of the readers direct control to provide a story that varies according to the conditions in which it is read

Alternative Nodes are structurally a localised form of Bernstein's Split-Join, however their use is to account for contextual variation rather than interactivity.
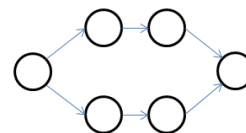
5.1.5 Foldbacks

Figure 10: Foldback

Foldbacks (shown in Figure 10) are similar to Alternative nodes but differ in their use and scale. In a foldback the reader's choice of location triggers a temporary alternative thread of one or more nodes before re-joining the central thread. Choosing one of these threads (in this case by activating one of the optional nodes by moving to its location) will invalidate the other thread. These are more similar to Bernstein's split-joins in their use, in that both allow a hypertext author to manage the agency of their reader, and avoid the exponential complexity that would result from continual branching.
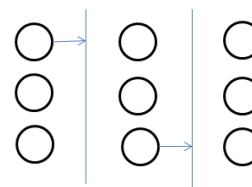
5.1.6 Phasing

Figure 11: Phasing

The phasing pattern (shown in Figure 11, where solid lines separate the different phases) arises when nodes, each with their own conditions and constraints, can be clustered into a number of different phases dependent on a significant change in state that shifts the available nodes from one cluster to another. It is typically used in open narratives where the story moves through a series of phases, but within each phase a number of nodes may be openly explored. The phase is advanced by either the reader visiting a key node, or a specific contextual state (such as the passing of time) being satisfied.

The phasing pattern matches the original mid-level structures of Chapters, Transitions and Timers that we proposed in the original CDP model, but do not necessarily have to perform the narrative function of chapters in the story. In fact in our story set they tended to be used in a more coarse-grained way to manage a three act structure (of beginning, middle and end).

While the phases we saw are typically sequential they don't have to be and a branching or open phasing structure could be possible (similar to deltas and plains but with whole phases taking the place of single nodes). The open nature of phasing patterns makes them inherently suited to sculptural hypertext engines, with little in the way of a calligraphic hypertext equivalent (the equivalence would be a set of nodes that were exhaustively interlinked, in such a way that any node was navigable from any other, this has superficial similarities to Bernstein's Tangle pattern, but fulfils a very different narrative function).
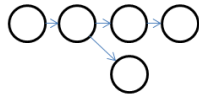
5.1.7 Unlocking

Figure 12: Unlocking

Satisfying constraints in order to "unlock" a node is a fundamental part of sculptural hypertext structure, and by itself does not constitute a particular pattern. However an Unlocking pattern is sometimes used (shown in Figure 12) to go beyond the simple linear story progression of one node after the other and instead build more complicated constraints where a range of different nodes must be visited to unlock a particular node. This could be used to progress the story (in which case it is related to Gating, but in this case the unlocking threads end at the unlock event), but in our story set it was typically used to open a additional diversionary node. These hidden diversionary nodes are similar to "easter eggs" seen sometimes in games or other interactive media in that they represent non-essential but additional bonus content to be sought out by the reader.

5.2 Story Examples

All seven patterns manifested in our story set, some manifesting multiple patterns within a single short story, as demonstrated in table 1 which summarises the stories collected and their structure and patterns.
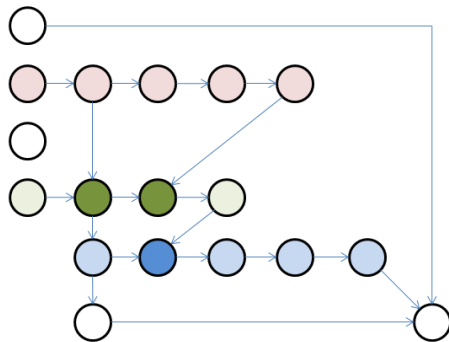

Figure 13: The story structure for 'A Walk in the City', arrows denote nodes being made available. Each parallel thread is highlighted a different colour, darker colours signify gated nodes.

In figure 13 the structure for the story 'A Walk in the City' is presented demonstrating triple Parallel Threads with Gating. A Walk in the City uses its Parallel Threads to deliver three separate short stories that the reader may switch between at will, while using gating to control the release of parts of the story until ideas and themes have been introduced in other threads. The story represents a collision of two genres: that of a tour guide (introducing parts of the city) and a romantic drama (taking place in the locations explained) and the two are interwoven across all three threads. The doubling/blurring of the text's genre identity is symbolically paralleled in the description of the landscape when an

occurrence of two streets with the same name in the city results in a miscommunication between the protagonists.
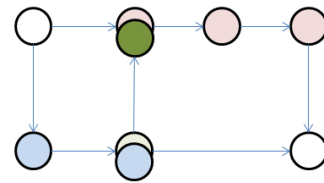

Figure 14: The story structure for 'Through the Years', arrows denote nodes being made available. Each parallel thread is highlighted a different colour, and darker colours signify gated nodes. Alternative nodes are present.

Figure 14 shows the story structure of 'Through the Years', which uses Parallel Threads but also makes use of Alternative Nodes. Through the Years uses its Parallel Threads to display the story from three different POV characters, it also makes restrictions on some content being available only in certain weather conditions but uses Alternative Nodes to allow the story to progress if these are not satisfied. The POV characters for the story are handled in two parallel threads with a third character existing only as alternative nodes for poor weather in the other 2 threads. This makes the third POV optional (and somewhat glum and dour in tone), and its presence as optional nodes in the other threads necessitates the use of a gate to control the order in which it is read. Each of the characters explores the city in a different time period and by using the parallel threads to allow the reader to jump between two of the POV's the author highlights and sometimes exaggerates the differences between the periods of time.
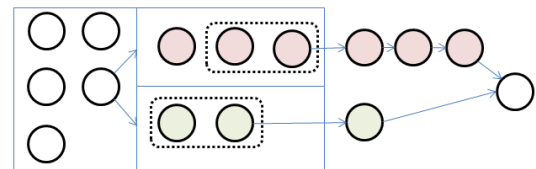
Figure 15: The story structure for 'Our Journey', arrows denote nodes being made available, dotted lines encircle concurrent nodes, and solid lines encircle phases. Each parallel thread is highlighted a different colour.

"Our Journey" is depicted in figure 15 and also makes use of Parallel Threads, but also Phasing, and Concurrent Nodes. The Parallel Threads are used to follow two different POV's once again, but also two different themes - one educational, the other more emotional. Allowing the reader to shifts between these allows them to access the tone and perspective they prefer. The story makes use of concurrent nodes and open phases early on to allow the reader to explore in a way that suits them, and potentially to allow them to decide which perspective they find more interesting, before locking them in to a much more linear series of nodes leading to conclusion.

Title*	Nodes	Genre	Structure	Patterns Present
That ship sailed a long time ago	10	Drama	Open/Linear	Unlocking
A Walk in the Park	17	Thriller	Open/Linear	
The History of Jesters ...	10	Biopic	Open	
The Biography of Mankind	10	Biopic	Linear	Alternative Nodes
A Shadow on the Wall	10	Biopic	Linear/Branching	Unlocking, Foldback
Do you see me yet?	12	Drama	Linear	
The Ghosts	11	Horror	Linear/Branching	Unlocking
A Walk in the City ...	19	Tour Guide/Drama	Open/Linear	Unlocking, parallel Threads, Gating
The Spirit of Southampton	4	Drama	Open	
Notes on an illegible city ...	8	Tour Guide	Open	
Sailing in the Wake	18	Tour Guide	Open	Unlocking, Concurrent Nodes
The Ballad of Elizabeth Loder	10	Thriller	Open	Concurrent Nodes
The Titanic Criminal in Southampton	8	Thriller	Open	Concurrent Nodes
Hollybrook	11	Drama	Open/Linear	Unlocking
An Unbreakable Bond	8	Drama	Linear	
Our Journey	16	Biopic	Open	Phasing, Concurrent Nodes, parallel Threads
The Saints of the City	10	Biopic	Linear	Alternative Nodes
Jane Austen's Days in Southampton	10	Drama	Linear/Branching	
A Place With a Dark Side ...	11	Thriller	Linear/Branching	Foldback
Ballad for a Knight	10	Poetry	Open/Linear	
Lights	14	Biopic	Open	Concurrent Nodes
Six Stories of Southampton	8	Tour Guide	Open	Phasing
The Ever Changing City	10	Tour Guide	Open	Unlocking, Concurrent Nodes
On the Wrong Side of the Wrong Town	17	Thriller	Linear	
(think of one)	9	Biopic	Open/Linear	parallel Threads
A glimmer of a past Southampton	10	Tour Guide	Open/Linear	
untitled	11	Tour Guide	Linear	Alternative Nodes
Through the Years ...	10	Drama	Open/Linear	Alternative Nodes, Parrallel Threads, Gating
Discovering Mary	10	Biopic	Open	Unlocking, Phasing
The Lost Letters of RMS Titanic	5	Drama	Open	Phasing
Waiting For News	8	Drama	Open	Unlocking
Edytki	17	Drama	Linear/Branching	
A Century Ago From Today	10	Tour Guide	Open/Linear	Unlocking
Ship In a Bottle	6	Drama	Linear/Branching	
The Witch's Curse	16	Horror	Open	Unlocking, Concurrent Nodes
Homage To The Vagrants	8	Drama	Open/linear	Concurrent Nodes, parallel Threads
Lost in the crowd	11	Drama	Linear	
Just Google It	10	Tour Guide	Linear	
The Green	9	Poetry	Open	
The Tale Of Molly DeVito	10	Biopic	Open/Linear	Unlocking

* Some long titles have been abbreviated or shortened.

Table 1: Story set, including title, size in nodes, genre, and patterns present.

5.3 Discussion

Table 2 summarises the patterns that we found in our story set, their frequency, and the calligraphic pattern to which they are best compared.

The patterns we have identified are a mixture of those that lend themselves to the mechanics of sculptural hypertext (such as Parallel Threads, Gating, Concurrent Nodes, and Phasing), and patterns that emerge from working with the context sensitive nature of location based narrative (such as Alternative Nodes, and Foldbacks). Sculptural hypertext represents a loss of control for authors when compared to calligraphic hypertext, and it could be argued that some of these patterns represent ways to get control back (so for example, using gating to manage the progression of multiple story threads, in the absence of explicit link structures).

On the other side of the comparison we find that Phasing, Gating, and Unlocking are unrepresented amongst the calligraphic patterns. All three of these patterns control the rate of progress within a story. It could be argued that such structures are necessary within sculptural hypertext to control or limit the way in which a reader moves through the content in the same way that a more explicit network of

links in calligraphic hypertext might limit navigation.

It is also notable that several calligraphic patterns are missing. Sieves, while absent from our patterns are directly analogous to the branching we see at a higher level, and Tangles are similar to the open structures we see in that there is a collection of nodes with a high degree of interconnectivity. However, Cycles, and Contours are important calligraphic patterns but are entirely missing from our story set; while a complex phasing arrangement could be constructed in order to achieve the same effect, the carefully constructed explicit link structures these patterns require are arguably better suited to calligraphic hypertext rather than sculptural.

This then seems to be the main difference in the patterns we observe in sculptural as opposed to calligraphic hypertexts, calligraphic patterns tend towards managing a reader's path tightly which is easily achieved with explicit links (for example, causing her to revisit previously visited nodes in a Cycle pattern), whereas sculptural patterns tend towards enabling openness (for example, by allowing a reader to follow multiple stories at once in a Parallel Thread, or by shifting the story in its entirety through different phases).

Pattern	Frequency	Calligraphic Pattern
Parallel Threads	5	Potential Counterpoint*
Gating	2	
Concurrent Nodes	8	Potential Montage*
Alternative Nodes	4	Split-Join
Foldbacks	2	Split-Join
Phasing	4	
Unlocking	13	

*Similarity can be rendering or reading dependant

Table 2: Pattern Frequencies within the set of 40 stories and their Calligraphic counterpart.

6. CONCLUSIONS AND FUTURE WORK

The Canyons, Deltas and Plains model framed location-based narratives as a form of sculptural hypertext, providing a theoretical framework in which different examples of the medium could be explained and understood in a coherent and comparable way. Unfortunately, sculptural hypertext is itself a relatively unexplored form, with few examples, and little critical theory to explain how authors might use it to express their ideas and realise their stories. This is a serious barrier to both the education of sculptural writers and the design of authoring tools.

In this paper we tackled this problem by working with 40 creative writing students, using an approach inspired by co-design and paper-prototyping, in order to create location-based sculptural hypertexts that we could analyse for common structures and approaches. The stories created demonstrate the high level story structures identified in our earlier work on the CDP model (linear, branching, open, and hybrid stories), but also authoring patterns that offer a more descriptive vocabulary for the structures that authors create, and the poetic effects that they engender.

The seven patterns we identify are Parallel Threads, Gating, Concurrent Nodes, Alternative Nodes, Foldbacks, Phasing, and Unlocking. Some of these demonstrate similarities with Bernstein's calligraphic patterns of hypertext, but others are more unique to sculptural hypertext.

Our work is based on a relatively small sample, and while we were careful not to lead authors, it is inevitable that our interactions will have impacted their choices. The patterns we have identified are thus clearly not exhaustive, and may be unrepresentative in terms of their frequency of use. Nevertheless, they represent the first serious attempt to understand the possible intentions of authors working in this space, and shed light on the poetic differences between calligraphic and sculptural hypertext. In particular the difference in emphasis between constrained and open exploration, the lack of cycles in sculptural hypertext, and the use of patterns such as gating and phasing (in place of link structures) to enable managed progression through a narrative.

It has been observed that building a richer vocabulary for patterns based on observations from actual hypertexts enables richer and more effective criticism [5]. It also provides a basis for educating new authors, and has the potential to inspire new ideas and support the creative process. From a technical standpoint this translates directly into the design of authoring tools. The challenges of building domain specific authoring tools are well documented[29][1][17]. By identifying these sculptural patterns we gain some insight into the techniques behind the creation of location aware narrative which could be used to create more effective and engaging authoring tools.

Thus having identified these patterns our future work will focus on the development and evaluation of authoring tools that embed them in the author's workflow, making them easier to employ within a given story. This in turn will enable further exploration of critical theory around sculptural hypertext, and hopefully lead to a new poetical understanding of location aware narrative.

7. ACKNOWLEDGEMENT

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