

Weaving Location and Narrative for Mobile Guides

Museums are designed as social spaces. They are places where people can talk, share experiences, and create collective memories. The spatial layout of exhibits allows groups of visitors to view and converse. Talk is encouraged and staff are employed to support families, school groups and tours. Yet much of the computer technology that has been introduced into museums is for individual rather than collaborative use. Handheld guides have been designed to be held up to the ear and multimedia museum displays usually have a single small screen. Recent developments such as museum guide applications for mobile phones continue the theme of supporting the solitary museum visitor. It is not surprising that some curators regard computer technologies as barriers to social engagement with the museum (Tallon & Walker, 2008).

Since the 1960s attempts have been made to design more social museum technology, including dual earpieces for audio guides (Tallon, 2008), quiz questions for pairs of museum users equipped with communicating handheld devices (Yatani, Onuma, Sugimoto & Kusunoki, 2004), multimedia displays that allow visitors to leave opinions and arguments relating to museum exhibits for others to view and respond (Hsi, 1997), and the use of social media to provoke conversations around museum collections (Johnson, et al., 2010). While these have had varying success in connecting and engaging visitors, they can create a fragmented experience where the visitor's attention is divided between the museum environment, the technology and the social interaction. In this chapter we explore how narrative structures can create threads of experience that connect visitors with museum exhibits and with the narratives woven by other groups of visitors through their conversations

and interactions. Computer technology can be designed to anchor these narratives to locations and enhance them through social interactions to create memorable experiences that can be replayed and shared.

The chapter draws on the model of ‘explicit interactivity’ proposed by the US game designer Eric Zimmerman (Zimmerman, 2004), where interactive objects in the environment combine to tell a story, presenting individuals or groups (who may variously be termed audience, players, readers or users) with opportunities to affect the content of the story as it is being delivered. The human participants, computer applications, and locations intermingle to form narratives that unfold through a combination of human-computer interactions and physical movements around the space.

Our aim is to offer museum curators and exhibit designers some ways of enabling visitors to create connected story interpretations of their museum experiences by engaging with software that is pre-programmed yet responsive to location and physical movement. This leads to a phenomenon known as the ‘Interactive Dilemma’: “the inevitable conflict between author’s determinism and interactor’s freedom” (Peinado & Gervas, 2004: 1). In relation to museums, it is the perennial tension between guiding visitors in where to go, what to see, and how to understand, or allowing them to wander freely and construct their own interpretations.

If a human tour guide is replaced by a location-sensitive multimedia device then the visitor has greater power to break from the well-trodden route and create a personal interpretation, but must also expend more effort in creating connected meaning out of the fragments of situated experience. A tempting compromise for designers of interactive guides might be to ease this effort by providing a variety of suggested routes or tours, adapted to user profiles,

but our early experience of developing a location-based guide (Naismith, Sharples & Ting, 2005) suggests that this might be the worst of both worlds, with the visitor frustrated at being presented with an order of locations to visit and without sufficient influence over the form or content to gain a satisfying experience. We attempt to resolve this dilemma by presenting narrative structure as the key feature in such experiences, an artefact designed for storytelling that can be controlled by an implicit partnership of systems designers, museum curators, and visitors.

Mobile computer-based storytelling

Mobile computer-based storytelling emerged from the commentary of a tour guide delivered as an audio tour on a portable handset. Some, such as Wapping Audio Tour, present a mixture of performance and sightseeing, narrated by actors: “The artists alternated between uncovering the existing history of this part of the docklands and creating their own through writing stories, staging a wake, talking to the people who live in the area and guiding tourists from the records of their walks.”(Wapping Audio, 2012). Interactivity comes from the visitor moving round the environment and keying in codes to get a commentary linked to the location. Recent projects have extended the interactivity by providing multimedia guides with touch screens to call up additional content (Proctor and Burton, 2004), or by automatically sensing the movement of the visitor to adapt the content to the user’s route and length of time at the current location (Lonsdale, Byrne & Beale, 2005). A good introduction to interactive handheld guides is provided by *Digital Technologies and the Museum Experience: Handheld Guides and other Media* (Tallon & Walker, 2008), including an entertaining history of audio guides.

Recent work has focused on digital mobile storytelling as a tool for learning (Jenkins, 2004; Nisi et al., 2004; Paay et al., 2008; Sprake, 2011). Properly executed, locational stories are an effective method for presenting educational history materials in an enjoyable manner (Aylett, 2006). Coherent and well-structured interactive stories can have inherent value, as interactivity helps audiences “to more intensely internalize the material” (Vorderer, 2003: 147) by laying down an episodic memory of events connected to physical locations and social experiences. Therefore, an understanding of locational storytelling can assist in the construction of successful learning materials as well as offering engaging stories in and about places.

The mobilised visitor

The UK design researcher Juliet Sprake considers the different kinds of relation between guide, tour and visitor, as author, text, and reader, as well as architect, building and user (Sprake, 2011). A tour is a continual work in progress, so a progressive dialogue between a (human) guide and visitors can be considered as analogous to an understanding of a text as a decentred system of language that can never be collapsed into finite meanings by an author (Barthes, 1986). Conversely, it could be argued that to give a building such as a museum a tour is to impose a limit on that building that encapsulates and closes its design. Thus, a tour is a temporally repeated point of tension between a pre-designed environment and an unfolding story of its use.

The mobilised visitor is both an observer of and an actor in this tense drama. Tours comprise the visiting experience and the documentation of that experience in the form of narratives.

These texts might be read by people before they visit a location, to understand its history and to plan the trip. So, even before they arrive visitors are designated as readers of a pre-

prepared text, yet they are also active producers of meaning by their actions in constructing the visit and interacting with the guide and the location. Sprake draws on the notion of ‘creative users’ (Hill, 2003) of a building to suggest that learning through touring can be understood through the kinds of new knowledge and experiences interactively evolved by spatio-temporal processes of touring.

Sprake (2011) proposes three attributes of the mobilised visitor as learner: stumbling upon, noticing, and connecting. Visitors stumble upon spaces in unexpected ways and in so doing create their own narratives of experience. They notice some parts of the environment in ways that are prescribed, and others in ways that create personal meaning, so that touring is an interaction between the noticer and what is noticed, where that noticing develops personal knowledge of the object. Visitors accelerate and decelerate, view from different perspectives, and enter into conversations and juxtapositions that create cognitive and social connections.

Designing directions and navigation activities in tours that depend on the physical mobility of participants around and between buildings opens up opportunities for learning through making imaginative associations between people, objects and places.
(Sprake, 2011: 38)

A framework for design of location-based narrative

Narrative is the process of combining “different heterogeneous parts (actions, events etc.) into a coherent whole and crafting the relationships between these different parts”

(Yiannoutsou & Avouris, 2010: 1). The mobilised visitor weaves a personal narrative by moving around a space, by noticing, or being informed about, the artefacts at each location and by making conceptual connections between them. This narrative may align or conflict

with the prepared stories presented explicitly by tour guides or implicitly by the spatial layout of a museum or heritage site.

Significant research has already been undertaken in defining the many structural forms applicable to interactive narrative and we propose a framework (Figure 1) to describe interactive narratives structures based on Ryan (1997) and Phelps,(1998). By matching different types of narrative structure to locations and encounters over time, curators may be able to commission interactive narratives for a combination of handheld visitor devices and museum displays that offer visitors a connected flow of experience and the perception of an unfolding story of their visit.

In our use of these structures, the nodes represent information-rich locations (where information may be presented by some combination of computer device, physical object or label) and the links denote physical movements between locations. It should be noted that the links do not indicate the physical direction of the movement, rather that two locations are connected by a user moving from the first location to the second. A story may be told explicitly at each location, or the user may create a personal narrative by connecting the pieces of information. In some cases a storytelling may continue as the user moves between locations, either to complete a story that started at a different location, or to provide a seamless continuity of telling.

[INSERT FIGURE 1 HERE]

The category definitions given in Figure 1 are not intended to be comprehensive, but they are relevant to the aim of exploring applications of different interaction structures to locational narratives in digital media. While examination of narrative structure takes prominence, it is

also necessary to look at additional factors, including the extent to which these examples are digitally delivered, their stated purposes, the relationships between user and creator, and the degree of locational involvement.

Contextual factors affect, and are affected by, these structures. The entity controlling the narrative structure can at different time points be some combination of a computer-based system, or a human administrator who dynamically adapts the plot, or the user interacting with the environment and technology to start, stop and nudge the narrative. Thus, a visitor as user is both in a context (e.g. listening to an audio narrative at a specific location) and a creator of context, through interactions between personal goals, locations, artefacts, technologies, and other people (Lonsdale, Baber & Sharples, 2004).

These narrative structures can be exploited for specific educational purposes by the designers of interactive guides and experiences, depending on how they are perceived in relation to learning and technology. The structures can be seen as instances on a continuum from narrative instruction (branching) to personal story making (diary). Or they can be considered as design resources, to explore how narrative can be embedded into a museum experience that enables stories from curators, designers and artists to be interwoven with the conversations and journeys of visitors. Or they can be interpreted as functional flow diagrams for software developers to program narrative museum experiences.

Tree-branching

The tree-branching structure (Figure 1a) is divided into acts: from one initial act, the user is presented with a choice amongst several possible continuations. Having picked one, the user

experiences that act before being presented with another choice as to which act should come next, and so on.

In moving from one act to the next, the user always progresses the narrative. The choice of acts is determined by the creator of the experience and this determines the level of interactivity: the more branches that are available, the more interactive the story. Applied to locational narrative, a node in this tree is a piece of information accessed at a location and a link is made by moving to another location. One direction of movement may lead down one branch of the narrative tree; another direction may follow a different branch.

Braided multi-linear

The braided multi-linear experience (Figure 1b) comprises a core narrative which branches out into a number of plot directions; these plots then converge again and reintegrate with the core. A user may temporarily deviate from the core narrative, but cannot avoid it or alter it.

The structure incorporates a traditional linear story but scattered with interactive branch elements. This gives it interactive flexibility, as the creators can control the exact number of branches and the points along the story at which they are encountered. An example would be a handheld guide where the user is directed down one physical route or another, based on the user's preference or profile, with each route creating a connected story.

Rhizome

In the rhizome structure (Figure 1c) all the nodes are interconnected. In theory, this can offer the user a large degree of agency: they cannot themselves define the narrative elements but they can control which ones are included and how they are ordered. As the user moves

around a physical environment and approaches a pre-prepared location, the device offers not a disconnected chunk of information, but a continuation of the narrative that is prompted by that location. This structure has similarities to a hypertext story such as the US author Michael Joyce's 'afternoon, a story' (Bolter & Joyce, 1987) where the user's choice of moves weaves a story out of elements of text and where revisiting a node may produce a different telling to the first visit. As a locational narrative, a well-designed rhizome structure may empower the user with freedom to roam between locations, yet engaged by a narrative flow that adapts to the (literal) moves and turns of the user and device. The stories of many visitors can be interwoven, so that tellings depend on paths taken by other people or how often locations have been visited.

Diary

A diary (Figure 1d) "capture[s] the particulars of experience" (Bolger, Davis, & Rafaeli, 2003: 1). It records a chronological log of the user's activities and replays it to them. The developer of the diary application does not influence its content, but provides the tools that allow the user to generate these records. The user determines the content of each particular segment and the order in which these segments are encountered. From the perspective of location and narrative, a diary structure might be a series of objects or signs placed at locations with means for the visitor to record the experience of encountering them. A narrative might be constructed by creating fictional computer-generated characters at each location who engage in a dialogue with the user, or by encouraging users to tell and share stories of their visits using materials collected on the tour.

Case studies of locational narratives

Having laid a foundation of narrative structures, we now provide some case studies of how these have been developed in practice for location-based guides, tales, and visitor experiences.

Tree-branching: A Chaotic Encounter

A Chaotic Encounter is an application, running on GPS location-aware devices, which delivers a short tree-branching audio narrative whose content depends on the user's movement (FitzGerald, Sharples, Jones & Priestnall, 2011). The aim with this research prototype is for the user to hear an entertaining story, based on a Nottingham folktale, that can be played a number of times with each rendition being subtly different. For the prototype system, the tree has three levels (Figure 2), with three branches at each level, so from a single initial audio segment, there are three possible continuations, and then three continuations thereafter, making nine possible narratives.

[INSERT FIGURE 2 HERE]

The story follows a classic Exposition-Climax-Denouement sequence, but the transitions depend on the user's movement. The GPS in the device records its speed and direction and as the system finishes playing each section of the story its continuation depends on how often these change. If the user walks at a steady pace, then the story features few characters and is relatively mundane. If the user changes speed or direction then the story contains many characters and is more surreal. The transition from one segment to another is instant, so the user experiences a single flowing story.

The system was tested with ten participants in two modes: automatic and manual. In the automatic mode, the users were told that their movement had an effect on the narrative, but not how this was calculated. In the manual mode, the system did not respond to movement: at the end of each segment the audio stopped and the user could select from one of three continuations. In each mode, the users could play the story as often as they wished. The users were interviewed at the end and they also completed a short open-ended questionnaire to assess their attitudes to each version. The results of the trial were that the users generally preferred the automatic movement-sensitive version as it did not interrupt the story. However, the GPS was too inaccurate to give reliable information on speed and direction, which sometimes resulted in the same story being played a number of times. New ‘smartphones’ now contain accelerometers, and these would be more sensitive to changes in speed and direction. Over a larger physical space, a combination of GPS and accelerometer could offer tree-branching stories that change with both location and movement. The difficulty for the designer comes in creating a narrative sequence for each branch of the story. If the story had a further three levels, each with three branches, that would require 27 different story endings, a further level would need 71 new narrative sequences, and so on. For this reason, a braided multi-linear structure, where the different narrative paths re-join, would be more feasible for a longer narrative.

Braided multi-linear: Hidden Histories: To The Castle!

Hidden Histories: To the Castle! was a pilot project to investigate how visitors experienced, and learned from, two different types of historical audio tour that took place in Nottingham city centre. One audio tour was led by members of a local community history group, who physically guided visitors along a planned route consisting of seven points of interest. An alternative technology-based audio tour was also created, that used a GPS-enabled

smartphone application to deliver audio at the same points of interest, together with a map of the route for participants to follow (Figure 3).

The subject matter was the Reform Riot that occurred in Nottingham in 1831, with a core narrative that explored the background to the riot and the conditions under which it occurred, followed by a succession of events that happened during the riot itself, leading finally to the aftermath of the riot and the consequences for those involved. At each stopping point, participants in the tour listened to historical accounts (either performed in person by members of the local community history group, or through their audio recordings delivered through smartphones) related to that particular location and the relevance or importance of that location to the events in the riot. These narratives came from a variety of sources and were intended to convey different, sometimes conflicting, perspectives on aspects of the riot as they occurred.

[INSERT FIGURE 3 HERE]

This project exemplifies a braided multi-linear structure, where the flow of narrative is central to the experience, branches out to explore sub-plots or contrasting themes, then converges once more and these side nodes are reintegrated into the core narrative. The different historical sources were analogous to sub-plots, where different perspectives could be compared and contrasted, such as ‘official’ sources (e.g. government or military reports) and eyewitness reports, which offered conflicting information about what was occurring at the time.

An initial evaluation of the project has analysed participant data to find evidence of informal public learning, through a framework to examine how participants attained a) historical literacy, b) historical empathy and c) the development of interpretation skills when listening to differing, sometimes conflicting, historical sources (FitzGerald, 2012). Participant data were collected through the use of questionnaires (n=16), researcher observations, and a post-walk group interview (n=6). All participants on both audio tours showed evidence of historical literacy, and some participants demonstrated historical empathy and interpretation skills. However, it is not clear at this time to what extent other aspects of the walk (e.g. use of technology, group vs. individual experiences, the demographic and socio-political viewpoint of the participants) might have had an impact on participants' engagement with the historical content.

Rhizome: Context Aware Gallery Explorer (CAGE)

CAGE is an example of a rhizome structure for museum and gallery visiting. The project was an offshoot from the large MOBIlearn project (MOBIlearn, 2012), funded by the European Commission, whose aim was to explore context-sensitive approaches to informal, problem-based and workplace learning, based on innovations in mobile technology. A test-site was installed in an art gallery at Nottingham Castle to explore contextual mobile learning (see Figure 4). This consisted of an ultrasound system to provide accurate measurement of the location of a handheld device: an iPaq multimedia personal digital assistant. The ultrasound transmitters can be seen placed on the radiators in Figure 3. When a visitor walked round the gallery, the technology located its position to within 10cm and provided context-sensitive information about the paintings, based on the visitor's current location, how long they were standing at that location, the route they had taken, and specific preferences such as the visitor's language. As the visitor walked past a painting for the first time, the handheld device gave a short audio description of its title and artist. If the visitor stopped, the device offered a

longer audio description. Then, if the visitor lingered for a longer period, the device provided a multimedia interaction where the visitor could see the painting on the screen of the device and click on parts of the image to get information about the painting's composition and technique.

[INSERT FIGURE 4 HERE]

One aim of the CAGE system was to deliver narratives through the handheld device that disrupted a visitor's procession along the line of paintings on the walls of the gallery. By indicating other paintings by the same artist or with similar composition in other parts of the gallery, the system was designed to find whether a multimedia device could encourage a visitor to make conceptual connections and conduct explorations of the gallery that would not be obvious from the physical layout of the paintings. Video and audio recordings of visitors using the guide showed that in this, the CAGE system was unsuccessful. Although some visitors glanced at paintings on the other side of the gallery when they were mentioned in the audio description, none of them actually moved across the gallery to continue their tour. It would appear that the physical design of a gallery or museum space, in this case reinforced by the long red carpet, exerts a strong linear pull that a simple suggestion to move elsewhere will not disrupt.

An alternative approach would be to design a more complex and adaptive rhizome narrative, where instead suggesting specific connections, the visitor's movement around the gallery or museum would always progress the narrative, whatever path is taken. The example of hyperfiction (such as 'afternoon, a story') suggests that this is possible, but it would require careful design.

Where the CAGE software proved successful was in providing simple audio ‘labels’ that invited visitors to stop and look at paintings as they walked past, and in supporting group interactions where the multimedia commentary sparked a discussion of the painting.

Although CAGE was implemented and tested in 2004, it remains one of the few indoor context-sensitive guide systems where an adaptive narrative can be generated simply by the user moving around a location.

Diary: MyArtSpace

MyArtSpace was a project that ran for a year from February 2006 in three UK venues: the Urbis museum of urban life in Manchester, the D-Day museum in Portsmouth, and the Study Gallery in Poole. Over 3000 children engaged with the MyArtSpace service whose aim was to improve the effectiveness of school museum visits by connecting learning in classrooms and museums. The general method was for the teacher to discuss a forthcoming museum visit with the class and decide on one or more questions to be investigated. Then the children visited the museum and were loaned mobile phones running the MyArtSpace software (Figure 4), to create multimedia diaries of their visit that they could share and present back in the classroom.

[INSERT FIGURE 5 HERE]

Thus, the narrative structure for MyArtSpace is a diary created by the museum visitors on a mobile phone. The children generally worked in pairs, moving freely around the museum or gallery to collect evidence that would help them answer the inquiry question. Some exhibits had two letter codes (e.g. ‘AX’) beside them and on keying in the code to the phone, the

MyArtSpace application provided a short multimedia presentation about the exhibit. The visitors could also take a photo, record a short voice commentary, or make a note. On pressing the 'Save' button, the presentation, photo, recording or note, was automatically sent by GSM phone connection to a personal website, which could be accessed after the visit at home or in the classroom to see a 'timeline' record of all the items collected. These could then be viewed, shared with other children, and included in a group PowerPoint presentation or a written story of the visit.

The MyArtSpace system was successful in encouraging children to spend longer engaging with the exhibits (an average of 90 minutes with MyArtSpace, compared to 20 minutes for a conventional school visit). It also encouraged the children to take a curatorial role, collecting and assessing evidence from the visit to form a narrative presentation that was not merely a record of the trip, but an attempt to address the inquiry question. For example, on a visit to the D-Day museum (which commemorates the Allied landings in Normandy during World War 2) one group of children successfully found and compared evidence to answer "Were the D-Day landings a success or failure?", while another group sought evidence for "What was the role of women during the D-Day landings?"

One difficulty with such a diary narrative structure is that the entries are contextualised. The visitor captures activity and experience at one set of times and locations, then views them at another where the contextualising information – such as conversation, ambient sound and peripheral vision – is missing. A time-ordered list of entries can help in re-capturing the particulars of experience and this could be further assisted by showing a map of the route taken through the museum space and the points at which the items were collected or recorded. But the visitor's intentions in collecting the evidence are still lost, along with the

original emotions and sensory experiences. A recurring theme from projects such as MyArtSpace, Ambient Wood (Rogers et al., 2004) and Savannah (Facer et al., 2004) is the difficulty in connecting experiential learning in the field with teaching back in the classroom.

More recent work in mobile learning has focused on how to create ‘micro-sites for learning’ in the field (Vavoula & Sharples, 2009), where learners can find, or be offered, the physical and conceptual space to reflect on their activity in progress, and to weave their collections and experiences into a meta-narrative that links together the diary entries into a coherent strand of inter-related evidence that addresses the inquiry question. The further the dissociation of this weaving in time and space from the original collecting of evidence, the more difficult the task becomes. Having the children work in pairs can help this process, if they are encouraged to question each other’s evidence: asking why that photograph or recording is relevant to the inquiry question and whether it can be captured in a more effective form.

The company that implemented MyArtSpace has now developed it as a commercial service, named OOKL (OOKL, 2012) that promotes cultural venues and enables visitors to download information about cultural objects and events to their smartphones. The service also encourages visitors to become ‘citizen curators’ by capturing digital content (images and recordings) relating to objects in cultural places which can then be submitted to the venue and shared with others who visit.

Modelling curatorial narratives: The DECIPHER project

The previous case studies have described how each type of narrative structure (tree-branching, braided, rhizome and diary) can be overlaid on a physical space by traversing locations of interest in an order selected by the designer, or chosen by the user, or both.

When the physical environment is a curated museum or gallery, as in the case of CAGE, the narrative produced by interacting with the handheld device has to co-exist with the narrative layout of the museum space. A lack of cohesion between the two narrative structures may offer additional opportunities to the visitor, or could lead to disengagement with the technology if it suggests paths not cued in the physical space. An understanding of the narrative structure used in a museum space can inform the design of location-based assistance that is sensitive to, and extends, the physical museum.

DECIPHER is a cultural heritage project, supported by the European Commission, that aims to formally model aspects of the curatorial narrative structure built across heritage objects. This model is now being used to develop software assistance for narrative construction in a number of settings such as curation of a physical museum space, design of online museum resources, or development of handheld computer guides. The formal model has been realised as the 'curate ontology' (Mulholland et al 2012). Development of the ontology drew on a review of the museum narrative literature and a detailed analysis of two museum exhibitions: Gabriel Metsu at the National Gallery of Ireland, and The Moderns at the Irish Museum of Modern Art. The paper by Maguire (2012) provides a full report of the analysis.

The DECIPHER project draws on structuralist accounts of films and novels to formalise interactive media narratives (Hazel, 2012) at three levels of description: story, plot and

narrative discourse. A story can be defined as a conceptualisation of the events that can be told. These events may be organised according to properties such as time and theme. A plot is defined as imposing an interpretation on the story in terms of relations between events, in doing so defining which events are important and asserting dependencies between them. A narrative (or narrative discourse) is a presentation of the story and plot in a form such as a physical or digital exhibition.

At the story level, aspects of an exhibition can be understood as collections of events organised according to properties. For example, part of the Gabriel Metsu exhibition organised his works and associated events chronologically to show the development of his style during the early part of his career. The rest of the exhibition covering the later parts of his career, once his style had become established, were organised according to themes such as subject matter and chronology was less important. At the plot level, exhibitions, and their associated visitor materials often refer to relationships between events such as how the creation of an artwork was influenced by historical events or events related to the artist or their peers. The paper by Collins, Mulholland & Wolff (2012) describes plot relations identified in curatorial narratives. At the presentation level, a museum exhibition may emphasise story-level temporal or thematic properties such as the organisation of art into schools and by time period (Wolff, Mulholland & Collins, 2012). Or it may focus more on the plot, for example emphasising how one artist was influenced by, or reacted against, the work of another. Lisa Corrin, the Director of the Williams College Museum of Art in the US, and colleagues (1997) describe how the work of Manet can be better understood if exhibited with the paintings he was reacting against rather than other impressionist paintings.

The 'curate ontology' of the DECIPHER project, with its levels of story, plot and narrative can be used to describe the four types of narrative structure (tree-branching, braided, rhizome and diary) and how they reveal their underlying story and plot.

A branching structure could be realised as a narrative that emphasises how the organising dimensions such as time and theme can be interpreted hierarchically. For example, a component of the narrative relating a particular time or artistic movement could lead to further optional components that sub-divide the time or theme. This could be understood as a more traditional, taxonomic narrative structure of a museum collection in which the visitor has the option to select greater or lesser levels of detail.

A braided narrative has a common start and end point and offers greater agency at intermediate stages. This structure is currently used in museum narratives. For example, as described in (Maguire, 2012), exhibitions may start with a primer space in which the visitor is introduced to ideas that can assist interpretation of the exhibition. The Moderns exhibition began with a primer space that introduced key concepts related to modernism. Exhibitions also often finish on a crescendo, associated, for example, with the most well known artwork in the exhibition. Between the introductory and concluding sections, reading order may be less managed, providing a braided structure, in which the visitor can follow various aspects of the underlying story and plot.

A rhizome narrative can be understood as emphasising the plot over the story. Here, priority is given to relations such as "influence" rather than story properties such as time. Plot relations may create a graph structure interconnecting heritage objects and their associated events. A rhizome narrative would allow the visitor to pursue these relations in any preferred

way. A potential role for location-based technology in a physical museum space could be to support such plot-based navigation still sensitive to the narrative structure of the physical space. A key strand of on-going work in the DECIPHER project is concerned with using the curate ontology to provide assistance in the construction, visualisation and navigation of narratives by both curatorial staff and visitor groups.

A diary structure emphasises the events of the story organised chronologically. For example, a narrative about the life of an artist organised by time could be interpreted as a diary narrative. In the area of narrative inquiry, the organisation of events by time is referred to as a chronicle (Polkinghorne 1998). Children in the MyArtSpace project created and shared chronicles of their museum visits to address the inquiry questions.

Guidelines for Weaving Location and Narrative For Mobile Guides

Here we offer guidelines for designers of location-based narrative guides and experiences, based on findings from the projects reported in this chapter. The overarching need is to address the ‘Interactive Dilemma’ of conflict between the designer’s desire for a coherent narrative flow and the user’s freedom to explore a cultural venue and construct personal meaning from its space and the artefacts it contains. Every object tells a story. Every space offers multiple interpretations. Every visitor weaves a narrative. The greater the opportunity for participants to interact with their surroundings and with the technology, the more difficult it becomes to lead them through a pre-prepared story. “If interactivity is the property that makes the biggest difference between old and new media, it does not facilitate story telling” (Ryan, 2006: 99). The task for a designer of location-based narrative is to provide appropriate top-down structure, enabling the visitor as user to engage with well-formed narrative patterns

that unify and interpret the visiting experience while giving a sense of freedom to explore and create.

Support the user to create narrative through movement

Previous studies of multimedia guides in museums have emphasised the importance of a ‘heads-up’ museum experience, where the visitor is engaged with the physical artefacts rather than fiddling with a digital display (Hsi, 2003). This, of course, depends on what the display shows and whether it complements or detracts from the visiting experience. In general, the aim should be for the technology to augment rather than replace the physical experience. One way to do that is to let the visitor weave a narrative through physical movement around the museum. The CAGE system, by tracking the user’s route, allowed the user to wander, heads-up, and offered simple audio prompts on passing each painting for the first time. The findings from the CAGE trials also indicated that if a visitor (or group of visitors) showed engagement with a painting, by standing in front of the painting and listening to the end of the audio description, then an interactive multimedia display could extend that engagement, by allowing parts of the painting and its composition to be explored in more depth.

Balance structure and freedom for rhizome and diary structures

Tree and braided structures prescribe a pre-set narrative flow, as the user follows the directed links from one node to the next. For rhizomes and diaries the user has freedom to explore the informational and physical space, moving from any location to any other. Thus, they place demands on the user to construct a coherent story from the fragments. This finding for interactive fiction applies also to locational narrative:

For a short work the audience may be willing to wade through all segments of a narrative in order to piece together a coherent story. For a longer work the tendency is for people to lose interest. (Phelps, 1998: 1)

A designer of a rhizome might support the user's construction of narrative by creating a structure whereby any tour produces a coherent story. But this is a hard labour, as it requires pre-plotting every combination of move between nodes (locations). For six locations, there are 15 possible connections, but that rapidly rises to 45 connections for ten locations, and 190 for twenty locations, even without considering what happens if a person revisits the same location later in the narrative. Authors of hyperfiction circumvent this problem by a variety of 'cheats', such as leading the reader round in circles: having a small network of nodes but with different story text for each visit. That depends on the reader not being aware of their position in the story network – but for locational narratives the visitor knows very well where they are in the physical space of a museum or gallery. To create a coherent flowing narrative from even a medium-sized rhizome network is beyond the current state of artificial intelligence.

The alternative, for a rhizome or diary, is to provide tools for the user to construct their own narrative of the visit, by recording their tour through the space and allowing them to add notes and reflections. Then, at a later time, the tour can be replayed, so the user can re-create the visit and form the series of location-based events into a personal recollection or a public presentation. That was the structure of MyArtSpace, which provided the user with a website showing a time-ordered series of items collected during the visit. A more sophisticated location-tracking system might also show a map with the visitor's route through the physical space.

Employ appropriate media and be sensitive to the environment

Hidden Histories: To the Castle! made effective use of audio and historically relevant surroundings to inform the user and invoke a sense of drama. The CAGE system switched from audio to mixed media when the user stood still in front of a painting for longer than 30

seconds. Practical guidelines for effective audio experiences have been investigated in (FitzGerald, Sharples, Jones & Priestnall, 2011). They also discuss sensitivity to local surroundings such as heritage sites where local residents live, especially if visitors are encouraged to explore the area on their own. A further factor when considering movement through physical space is the need for participants to be aware of safety hazards in their immediate environment such as traffic, uneven flooring, or other people moving nearby.

Conclusions

This chapter has shown how narrative structures can influence the design and purposeful use of location-based guides for museums, galleries and heritage sites. Each structure offers a different range of possibilities: for the designer, to provide tools, media, stories and guidance that shape the activity, and for the visitor as user of the technology, to interpret stories, create narratives through action, and afterwards construct a coherent telling of the experience. A tree-branching structure can integrate the taxonomic structure of a museum collection into an unfolding story. A braided narrative can fit with the physical layout of a museum, with fixed start and end points and guided routes through the collections. A rhizome structure may allow visitors greater opportunity to create their own connections between exhibits and to intersect with the paths and stories of other visitors. A diary provides a chronological drive to explain a sequence of events or create a memorable recollection of a visit. In all these structures it is important to maintain a coherent sense of story, so the participant is not lost in a confusion of real and virtual narratives. We hope the discussion of structure for interactive narratives will lead to the design of new types of mobile guide and museum display that connect a strong narrative drive with freedom for the participants to enjoy stumbling upon, noticing, and connecting in their rich surroundings.

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