Hopstory: an Interactive, Location-based Narrative Distributed in Space and Time

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Abstract. As computing and communications technologies evolve, there is the potential for new forms of digitally orchestrated interactive narratives to emerge. In this process, balanced attention has to be paid to audience experience, creative constraints, and presence and role of the enabling technology. This paper describes the implementation of HopStory, an interactive, location-based narrative distributed in space and time, which was designed with this balance in mind. In HopStory, cinematic media is housed within wireless sculptures distributed throughout a building. The audience, through physical contact with a sculpture, collects scenes for later viewing. Inspired by the history of the installation space the narrative relates a day in the life of four characters. By binding the story to local time and space and inviting the audience to wander, we amplify the meaning and impact of the HopStory content and introduce an innovative approach to a day-in-the-life story structure.

1 Introduction

Over the past few decades, researchers and artists have explored computation as a storytelling medium, resulting in an explosion of eye-catching interactive media experiments. While many hypermedia stories have been published as CD-ROMs or on the WWW, success has been limited suggesting they lack the compelling depth of more traditional linear media. Meanwhile less commercially focused explorations have taken place in research laboratories and under the direction of individual artists. Many of these experiments propose novel interfaces or extend the reach of computation into the presentation form or navigational paradigm. However we are concerned with the structure of the story itself, with what makes a "good" computational story. One lesson that rings true from the previous research is that the opportunity for digital interaction with story content alone does not constitute a meaningful narrative experience.

As Kearney [1] points out, every story is told by someone to someone else. He develops this argument, suggesting that innovation in storytelling depends on both the medium and the story being told. Non-linear, computationally-augmented storytelling is still in its infancy. Over the past 15 years, most research has been tethered to a technological resource: link-based hypermedia and other script-based computational frameworks have been used to publish fiction [2], documentary [3] and a variety of

histories. While many interactive fictions have been published on CD-ROM, few continue to be referenced. With a few notable exceptions (such as Myst), those works that lock viewers into a single user, screen-based interaction seem to be limited in their ability to deeply engage and touch.

Many factors may account for this unsatisfactory experience: choice of story, style of telling, conflict between the physical act of interaction and the mental processing of story, the promise of non-linear infinitude and the expectation of catharsis. Despite these difficulties, more thoughtful structures for computational stories are slowly emerging. Over the past few years, wearable computers and PDA's with GPS or other location sensors have made it possible to construct location-based cinematic narratives. In this form, the audience members receive narrative elements as they physically navigate through a geographical story space [4],[5].

Extending this work, the installation discussed in this paper, HopStory, describes the implementation of a novel location based narrative. This approach takes a digitally-enhanced story beyond the computational desktop and distributes it in a physical space that humans navigate in day to day life [6]. HopStory explores the opportunity provided by such forms to link content to the setting in which the story is being experienced, allowing the space to express history and personality. In the following sections, we describe the implementation, technology and content that comprise the HopStory installation.

2 Hopstory

With HopStory we intended to create a historically inspired distributed story for a specific location such that physical navigation of the space by the audience becomes an editing process through which audience members realise their own version of the cinematic narrative. With this as our creative goal, we began our research into the history of the area and of the building that would host the installation. This research informed the development of the character-based story, which focused on four character's different points of view on the same events, taking place during a single day of work in the installation building, originally a brewery. This was then further analyzed to obtain a plot that maximized the continuity between the character viewpoints so that it could be filmed as forty-eight separate segments.

In the installation, the audience can collect story parts according to story time and character as they walk through the building. They then view their own edited version of the story, featuring the clips in the order that they collected them, at a designated playback station. Only in this moment of playback the viewers fully experience, their personally assembled story.

HopStory is novel in the way in which it marries physical navigation through the installation with character point of view. As Rokeby [7], points out, the story space can be conceived as a navigable structure or world: "The navigable structure can be thought of as an articulation of a space, real, virtual or conceptual. The author structures the space with a sort of architecture, and provides a method of navigation. Each position within the conceptual space provides a point-of view, defined and limited by

the surrounding architectural structure. Exploring this structure presents the spectator with a series of views of the space and its contents. The sequence in which the spectator experiences these vistas forms a unique reading of that space". In the case of the HopStory the architectural metaphor can be taken literally.

Furthermore, the story connects to the audience's sense of time. As the story progresses, the characters move through the building, living out their day in the early 1900s. Similarly, as the audience wanders through the same building, experiencing the installation, they encounter the four characters at different locations and times. The audience encounters sculptures modeled after a brewery cat, a special character in the story. The sculptures indicate the locations where the story content is available.

Fig. 1. Cat sculpture in location

Using a simple physical object (described in section 2.2) for interacting with the sculptures the audience is able to collect scenes. When a scene is collected, an audio segment from that scene is played. Essentially, through contact with a cat, a participant receives a new scene and uncovers a character, who responds by revealing a part of his or her story. The instantaneous audio response may encourage audience members to seek out more scenes to add to their collection.

The audience controls the number of clips they collect but do not know what events they will witness before they make contact with a sculpture. Much like wandering through an actual building and choosing to eavesdrop on chance conversations, audience members edit their own movies by navigating the building space. However, rather than viewing each scene at the moment it is encountered, the audience saves up their collections for later viewing, allowing interaction with the system while carrying out other tasks, and experiencing the movie when it is convenient.

We found that the location-focused nature of the story provided a creative playing field for developing content. In the case of our installation, designed to be housed within a culturally significant brewery building, the historical inspiration was natural. Access to the physical setting of the characters' lives provided a concrete starting point for research, visualization of scene description, and conception of plot events. An additional character with a different role to play, a cynical brewery cat, wanders around the story providing historical anecdotes in what we called ambient scenes where no human character appears.

2.2 Installation

The installation was expressed by seven cat sculptures, which were embedded with small metal iButton receptors [8]. Six of the cats were spread through one floor of the building, and the seventh was seated on an armchair in a lounge area. The cats were designed to be eye-catching, and were around 1 meter in length.

The movie scenes collected by the participants were carried to the lounge area and projected onto the wall, for anyone nearby to view.

Participants were given a key ring, which contained a metal iButton for storing clips, and a card with brief instructions for navigating HopStory. When a cat was located, a participant was to connect his or her iButton to the metal receptor embedded within each cat, in order to 'store a scene' onto the iButton. When participants were satisfied with the collection they had stored, they could touch the iButton to the cat at the projection area and watch the movie they had collected. The instructions noted that a given cat could be consulted multiple times during the day, since the characters moved back and forth between different sculptures. During the demonstration, the story ran for the duration of one hour, with the scene advancing every seven or so minutes within each cat.

2.3 The Content

The story has been created with the purpose of providing the audience with a flavor of a day in the hop store when it was an industrial building. Four fictional characters bring the audience in four different journeys through the hop store during normal a day of work. The characters are informed by personal accounts of social conditions of the Liberties, the area surrounding the brewery, and the lifestyles of workers at the brewery in 1920 [9,10]. Plot events center around an accident caused by a combination of arbitrary actions from each character, providing many causal threads from which the audience build connections.

Each character can enter the building, and the story, at a different point in the day. Ambient scenes supplement the narrative, providing background historical information during the story times in which no character is present. Like traditional story forms such as the novel, play, or film, the form of HopStory imparts new constraints onto the creation of the content. The narrative was broken down into forty-eight fragments that illustrate the lives of the four characters as they progress through their day.

The HopStory narrative is ultimately portrayed in the style of traditional cinema, through a linear movie. The received movie is pieced together differently by each participant who interacts with the system, and each movie will posses a different number and combination of scenes, characters, or plot events. The constraints of such narrative assembly creates interesting challenges regarding the composition of story fragments. Each scene is somewhat anecdotal, so very short assembled movies will

be meaningful. The story progresses in parallel with real time, insuring that the story will never go "back in time".

Simple themes are referenced in multiple scenes to unify the character's stories. For example, one recurring theme is that the character of the buildings foreman is very hungry, because he missed dinner the previous evening and then forgot his lunchbox. This is mentioned multiple times during his narration of the story, influencing his actions during the day of work. To connect to this theme, the other characters often refer to food and meals during the day, linking the story fragments narrated by the different protagonists. For example, the foreman's daughter starts her day by bringing a lunchbox to her father as shown in figure 2.

The characters do different things during the day, the foreman attends to the machinery, the foreman's daughter wanders through the building and sometimes they can be seen at the same time in the same location or dealing with the same event from a different perspective, giving the impression of a connected overall narrative. An example is the accident that happens in the hop store in the late afternoon. Each character experiences it in some form, even if just auditory. This technique is used to emphasize the differences in point of views of all the characters regarding the same incidents. The accident involves one of the characters, a boy falling on the ground and it can be experienced by the audience from each character's perspective: the boy falling from the stack; the foreman witnessing the accident and feeling guilty about having assigned the task to the boy; the girl scared by the noise but curious about what is happening; and the surprised planner, who hears the noise and wonders what's happening on the other floors of the building.

Fig. 2. Frame from the video showing the foreman's daughter delivering the lunchbox

The perception of the different story fragments as a whole is further facilitated by the presence of some characters in other character's scenes. For example the boy's character arrives late into the hop store building. As he sneaks inside, he sees the foreman character drinking a glass of beer with his men near a window. The viewer

can see the men laughing at the window from the boy's point of view. At the same time, the story experienced from the foreman's side won't mention the boy, because they can't see him. While hiding from the foreman behind a wall, the boy is spotted by the planner. From the planner's point of view the fact is of minimal importance as he is completely absorbed in his work and barely notices the child. The boy would be just a shadow in the background for the planner, but from the boy's point of view, the incident is quite important. In the boy's scene, the planner walks by in front of him and stares at him for a second. The boy then puts a finger in front of his own mouth asking the planner not to tell the other workers about him hiding behind the wall. We believe that this way of recalling characters from other peoples perspective is quite effective in bringing unity to the whole story and suggesting continuity of place and time.

With these techniques, we attempt to ensure that an audience member receives a coherent and meaningful narrative regardless of the number of scenes collected and the order that they gathered them in, independently of the presence or absence of any specific scene.

2.4 The Technology

The technology used in HopStory enables audiences to collect and play back their story scenes through physical contact with the cat sculptures. The physical contact occurs with the use of iButtons, metal canisters the size of a coin made by Dallas Semiconductor which store small amounts of digital information. These were handed out to the audience on key rings before the demonstration. Figure 3 shows an iButton key ring and a cat sculpture.

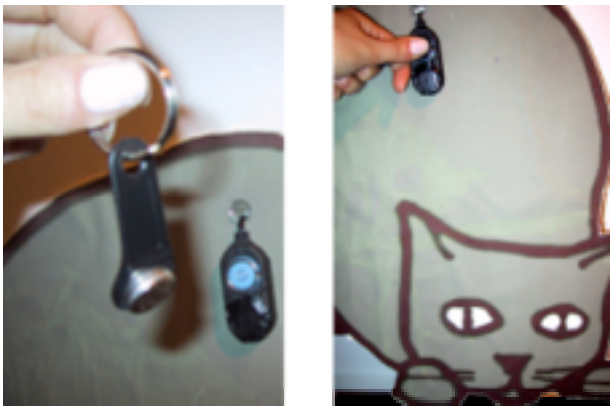

Fig. 3. iButton and iButton interaction with the receptor on the cat sculpture

The iButton receptors are small metal contact points, which were embedded in the cats. The receptors were plugged into the serial ports of six laptop computers attached to the cats. The audience roamed the space with their iButtons and then, as conven-

ient, engaged with the sculptures to collect data. When the scene was acquired a short audio segment from the scene was played. At the same time data was uploaded to their iButton. Video clips associated with this data could then be retrieved and viewed at the playback station.
For each of the six locations, eight scenes were written, progressing through eight time slots in the story day. Each was tagged with a two-digit ID number indicating the time slot and location. This was the information stored on the iButton and used to reference the video clips at the playback station using custom software written in Isis [12] .

3 Related Work

Research and installations relating to multi-viewpoint stories, place mediated historical recollections, and tangible interaction provide the background to the HopStory system. For some time storytellers in a variety of formats have been exploring the use of multiple points of view as a way to structure narrative. In this context, authors have chosen to build characters who drive the narrative, to stimulate the audience to choose among different prospective on the same events. As Mazalek observes "One of the advantages of multiple viewpoint approach is that it leaves greater possibility for different viewers/readers to relate to different characters depending on their own personalities and preferences. Further more, events can take on a variety of meanings depending on whose perspective they are viewed from" [14].

The idea of buildings as containers for stories and place-related narratives was explored in the Weirdview hypermedia project [15]. The audience is provided with a graphical interface portraying a row of houses in a street in Lucan Village in county Dublin. Real stories of people living on the street were collected and arranged using the houses as metaphoric containers of the stories.

Exploration of the physical navigation of story space is evident in Tamara, an interactive dinner play by Krizanc [16]. The story frames an upstairs/downstairs drama, taking place in the rooms of a large mansion house. Audience members start out in one room and are free to follow the actors when they move around the house as the story progresses. If there are two actors playing a scene in a room and one storms out, audience members must choose which actor the will continue to follow. The audience sees only a portion of the story relating to the characters they find most interesting.

Strohecker et al. describe [17] Tired of Giving, an interactive screen based story relating to the statement against racial segregation made by Rosa Parks in the United States. Viewers explore the story through the multiple perspectives of the different characters and a three-part chorus inspired from the ancient Greek theater.

HopStory was also influenced by previous work on tangible interfaces. In Genie Bottles, the audience explores a multi point-of-view narrative by lifting the corks of three glass bottles associated with three genie characters [18]. Each genie has a distinct personality and background that affects how he or she talks about the events in the story. Each time the audience interacts with the bottles, they release slightly different

perspectives based on which genie(s) they listen to, in what order, or for how long [14].

Spatial cinema has been the focus of several projects of the Interactive Cinema group at the MIT Media Lab including Elastic Charles (1987), Elastic Boston (1990), and Boston: Renewed Vistas. Most recently, Pan's describes M-Views which focuses on developing hardware and software to support the creation of location-aware mobile cinema [5]. In the current implementation, audience members carry iPAQs, equipped with a GPS or infrared sensors, and an 802.11 network card. "Another Alice", was the first cinematic experience developed for the M-Views system and was set within the MIT campus [6].

3 Evaluation and Future

We created the Hopstory as an exercise in designing a distributed story incorporating portable technology in the narrative process. The story develops in time, with a linear progression of the plot mapped to real time and unfolds in space using the architectural layout of the building as a navigation tool. Depending on the time and the space the audience is situated in when interacting with the Hopstory, they retrieve parts of the story from different characters points of view.

Hopstory was demonstrated at an exhibition held within our lab in January 2002. This event attracted a large and diverse group of academics and corporate representatives to our facility. Throughout the day of the event visitors entered, we handed them an instruction card and an iButton. Visitors could freely roam the floor, using this equipment with the cats of the Hopstory.

We made a number of observations of audience behavior throughout the day and received a large amount of spontaneous commentary on various aspects of the Hopstory. These insights are briefly described below. The audience was interested and curious about the distributed structure of the narrative; they appeared to find the concept of a location based narrative fascinating. A variety of visual aids were used to explain how the story was distributed in space and time as shown in figure 4.

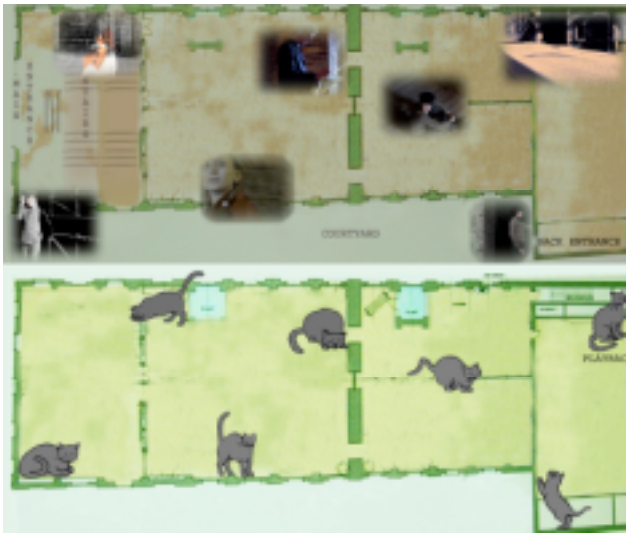

Fig. 4. Story and installation maps

Very few audience members had problems with the technology. The interaction was simple enough that most users were able to interact with the system with no difficulties. The audience also responded well to the physical form of the sculptures, finding them appealing. The separation of story navigation and story viewing provoked mixed response among the users. While some had difficulty relating the collected fragments to the experience, others reported a relaxed experience. They pointed out that not having to stop and view the story at every node created a less disruptive experience that contributed to a more coherent plot.

Many visitors who kept the iButton with them collected story fragments in different ways, when they happened upon a cat sculpture. When these visitors came to the playback area to cash in on their story, we usually had to refresh their understanding of how the experience worked. Other visitors focused fully on the HopStory installation, actively searching for all the cats; these visitors collected story segments rapidly and then came to the playback area to review the story they had collected while navigating the floor. Few wanted to go back and experience more stories because they were aware the story was occurring in their time. Finally, the visitors passing by the playback area usually stopped and watched movies that others had collected and wanted to talk about the demo.

An advantage of using iButtons for interaction with HopStory was the non-intrusive quality of this technology. IButtons are portable and undemanding, leaving the user free to make choices about their level of engagement with the story at any given time. They could remain in a bag or pocket, easily accessed if a participant chose to engage with Hopstory. They stored story bits so that a conversation could be held during collection, and viewing could occur later when convenient.

The Hopstory experience has opened new research directions within the form of physically distributed interactive storytelling. The idea of linking a story to place can

be taken further under the HopStory framework. The story content could be rigorously mapped to specific location- the scenes in the movie could depict the exact spots where the story fragments are available. The sculptural objects could also be enhanced to reflect story content, taking the physical form of objects or events in the narrative. We envisage our Hopstory installation as an exciting step forward in developing new forms of computational interactive narrative, which weds story content organically with enabling technology.

After testing the Hopstory, the evaluation pointed out the direction for future work. A seamless interaction between the story and the audience is being redesigned using Bluetooth technology instead of the iButtons. The content need to fit a broader space, the plot tightened and the characters personality deepened to foster engagement and curiosity about the story. From these findings a second iteration of the Hopstory sytem and installation is now under development.

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