Nature Trailer- Physically Navigate Stories in the Wild

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ABSTRACT
Nature Trailer is an entertainment and navigation platform that attempts to facilitate recreational exploration. Designed for a hiker wandering through a remote place, Nature Trailer virtually embeds context-aware stories throughout a landscape and provides clues of their locations. In this scenario a user is mobile, on foot, outdoors, and with little access to network infrastructure. The wireless platform we describe in this paper consists of sensors, movie scenes, a context aware media browser and a navigation tool, all supported on an iPAQ handheld computer. We discuss our motivations behind combining a time-based decision-making tool that supports individual, on-foot navigation of place with delivery of contextually aware "just in time" stories that further inform about the remote place. We explain the iterative methodology used by the researchers, including the design, analysis and evaluation of a series of multiple small-scale field tests and the design and utilization of real-time sensing as contextual input. We conclude with a report on the current state of the project and a projection of further uses for the logged user interaction and context data in iterating the Nature Trailer design.

Keywords
context-aware story, time-based decision making, weather sensors, navigation, field trial

1. INTRODUCTION
What kind of new entertainment possibilities are offered by a mobile computer which gathers real-time contextual information about an audience? How can a non-linear story aid a hiker in deciding which areas of a landscape to explore? Two necessary ingredients in an approach to these questions may be dynamic navigation advice and 'smart' stories, both which must respond to user context.

Based on past work in mobile context-aware story and navigational tools, we have articulated a combined navigational and entertainment platform which is designed for use in a wild place. The concept and design of the project represents a collaboration between the Everyday Learning and Story Networks research groups at Media Lab Europe. Our prototype platform, "Nature Trailer", can be thought of as an environmentally aware treasure hunt, with audio/video story scenes as the treasure, and a dynamic navigational interface as the treasure map. This scenario encourages exploration of an unknown landscape.

As a site study we chose an island called Cape Clear, seven miles offshore from Baltimore, in Ireland's Co. Cork. Our prototype production is a fragmented movie about a West Ireland seal legend, narrated by two fictional characters. The scenes have been scripted to take dramatic advantage of the audience's outdoor context in general, and the real-time skyscape in particular.

Figure 1. Testing the Nature Trailer platform on Cape Clear

1.1 Scenario
Imagine a hiker who has no specific agenda in exploring a remote landscape. Using Nature Trailer, she carries an iPAQ handheld computer and a light pack containing environmental sensors [Figure 1]. Different mythical story scenes become available depending on where she moves through the landscape and how the weather behaves. She can consult an interface on the iPAQ display for clues about the dynamic story content and its location.

At personal decision points, this user may consult the navigational interface, which is depicted in figure 3. In doing so she receives indication of the compass direction and her distance from story pieces, as well as a short audio teaser from each scene. The user may then use this information to choose to navigate to a given story 'hotspot'. When she arrives at one of these hotspots, a weather dependent scene is screened on the iPAQ display.

Scenes may arrive in a variety of sequences (with some built-in plot advancement). With this semi-linearity, there is no one fixed goal. The navigation interface can aid the user in a decision to visit one part of the island over another, given the scenes' distance apart, their distance away from her current position, and the amount of time she has to spare. The landscape of story hotspots continually changes, with new stories becoming available and others disappearing off the map. The changing availability of content depends on the weather- some scenes are meant to be viewed under a blanket of clouds, and others only in rain.

Figure 2. Image from a story scene, captured at the location where it will be screened

2. DESIGN RATIONALE

Throughout development of Nature Trailer we attempt to maximize the benefit of user context given the constraints of the mobile, remote, outdoor scenario. These elements affect both the design of the navigation tool and the production of a prototype movie.

Our chosen scenario requires an interaction designed for a small screen, and which does not detract from, but enhances the analog richness of an outdoor hiking experience. We minimalize the need for the user to directly engage with the interface, thereby the user benefits from environmental and location-based information while remaining free to enjoy the trek. The stories are scripted to use sensor data for the purpose of blending the fictional world with the user's real-world setting and thus enhancing appreciation of both.

2.1 Context Sensing

Why and how does Nature Trailer use context sensing? Context awareness for our purposes was an opportunity to provide Nature Trailer with information about the real-time physical surroundings of the user. This information would then be used to amplify the engagement and impact of movie scenes, and to filter information provided to the user through the interface.

We chose to determine this real-time user context by sensing GPS location, compass orientation, wind activity, cloud cover, and precipitation. Location allowed us to position the map interface with the user at the center, and enabled us to determine the small-scale landscape features in the user's vicinity. Compass sensing provided a means of intuitive interaction with the navigation interface. The user, by pointing the device in a particular direction, browses the story icons to scan the landscape for scenes.

We chose these specific weather sensors based on their ability to detect the general state of the skies. An anemometer detects wind speed, which we average over short time periods to understand whether it is generally blowing or calm. A leaf wetness sensor allows the system to understand if there is rain falling out of the sky. We employ readings from a solar radiation sensor to detect the state of the overhead landscape in terms of somewhat subjective categories of sunny versus overcast.

Our choice of sensors was not arbitrary. The particular contextual data we chose to gather resulted from our earlier stated goals in developing a platform such as Nature Trailer. These decisions were driven both by the entertainment content and the navigational aspects of the platform. Sensors were chosen to support a vision of movies that understood user setting, and a vision of a navigation tool which understands what a user likely does (and doesn't) want to know in order to make decisions about where to go.

2.2 Story

The Nature Trailer content is a movie, authored in parts and based on an Irish/Scottish seal myth. All hikers experience the same introduction as they make their way to Cape Clear Island by ferry. During this ride, fisherman Joe addresses the hiker. "I used to live on this island- I fished the waters around here. That was a time ago, the only voice I've got left is what comes to you now through this little machine. This is your window to the stories on the island. ...her [the seal woman's] memories will come to you in those places where your machine guides you... And when the skies change, her stories move onward towards our end, towards the day when I lost her, when, as the sea does so well, the sea took her away from me."

After the hiker disembarks she might walk across the island to the South Harbor [Figure 2] to find a scene narrated by the seal woman. "I saw Joe's boat bobbing but there was no one on it. I went back for my skin but it was gone. Joe had taken it... I was not to go back to the sea again for a long time."

When context data is used to shape a movie experience, the story is no longer a predetermined, fixed entity ignorant of the state of the audience. [1] The story engine, a flash application, compares GPS and weather readings with scenes' meta-data, and a match determines which scene is screened on the iPAQ. In producing the scenes we took advantage of sensor data through narrative elements of tone, setting, sequence, and plot development. This data allowed us to come closer to creating a movie that is relevant and personal to the viewer.

We use location-sensing to ensure that video of each scene is filmed at the place where the scene will arrive to the user. For example, the video which accompanies the above quote from the seal depicts the protagonist on rocks by South Harbor, as well as

images of a fishing boat in the Harbor. In this way the scenes are meant to augment the reality of the user's world. The feeling that "this happened in the place I currently stand" can further suspend disbelief and increase audience immersion in the story.

Our weather-sensors, which determine the real-time skyscape, allowed us to match scene content to this aspect of user setting. For example, when the user arrives at the harbor while it is raining, a scene may arrive of the seal woman looking out at the harbor through a rain-streaked windowpane. By sharing similar conditions the user may empathize with the character. Also, the relevance of the seal's story may create the impression that the character knows something about the world the user inhabits, and thus the story is personalized.

This weather-dependent aspect of scenes also implies that when the weather changes, new scenes are available in a given location, and previous scenes are lost. Varying weather conditions can reveal many different aspects of the culture and tone of a place. By being weather-dependent, the stories encourage users to experience a range of these aspects.

Apart from weather and location awareness, the stories were designed in general for the user scenario of a hiker in an outdoor place. The scenes are brief- around 20 to 30 seconds each- so that it is reasonable to view them and stay on the move. We are working further to create visuals that will call attention to details of a landscape rather than duplicate a vista that is already available to the in-situ user. We hope to user-test the fully produced story in February of 2004.

2.3 Navigation Interface

In consideration of the small size of the interface and its intended use, we strove to limit the amount of direct manipulation of the GUI. We accomplished this by moving much of the interaction into the physical world through the use of environmental sensors.

As the hiker uses the device to search for information or stories about the surrounding environment, the GPS receiver obtains the hiker's latitude and longitude and the digital compass determines her orientation. This contextual information is the basis for positioning and orienting the map in the GUI, as well as filtering and spatially positioning the relevant media as icons on the map. The hiker need only interact by tapping these icons to trigger short previews of the location-specific media.

Similarly, position and weather conditions trigger screening of the full story scenes. The hiker can control which stories she receives and their order of play by navigating within the physical environment. To affect weather-related changes to the stories, the hiker can either return under different weather conditions, or by varying her position within the immediate locale she can exploit microclimate differences to generate different weather readings. For example, by climbing on top of a wall she might expose the sensors to higher wind conditions.

By relying on context sensitive sensors, we have been able to reduce the amount of traditional GUI interaction and replace it with forms of interaction appropriate for the devices intended use.

Figure 3. Early GUI design

3. METHODS

We developed a prototype system of sensors and story scenes that we could transport and test over short time scales such as a few hours. The platform includes software to log and timestamp values such as GPS, user interaction with the interface, and wind speed. We also iterated the production of story scenes, subjectively evaluating the emotional impact of viewing during various specific types of local weather.

3.1 Iterative design and field trials

Hiking or hill walking is an opportunity for people to escape from the pressures of everyday life and to relax. We are sensitive to the impact a technology such as this might have on a hiker's experience. It was clear from the start that the lab setting would not be conducive to recreating this experience, though most of the development would necessarily occur in Dublin. Noticeable changes in environment in an indoor or urban setting are not the same as those in wild settings where conditions are more exposed, and human-made distractions are less likely. For this reason, we engaged in multiple field trials from the very beginning in order to place ourselves in the hiker's shoes. We continue to repeat this process as the project moves along, each time re-evaluating and iterating our design to reflect the lessons we have learned.

While still in the idea stage, we composed role-play scenarios of a user in a trekking context using our proposed system. We then traveled to a local hiking trail with a handheld computer and a camera. Using the handheld computer simply as a prop, we acted out our scenarios. We filmed the various role-play exercises both as a way to demonstrate our ideas to others and as a way to reflect on our design choices. Throughout the process we continued to brainstorm and to take notes on the perceived usefulness, feasibility and general feel of the interactions we were acting out.

Once we decided on a location around which to develop our platform, we developed a portable prototype consisting of working sensors and a software application to continuously log and timestamp location-based readings. We also created a handful of short story segments. We then took several trips to Cape Clear to evaluate these elements.

One purpose for the trips was to calibrate the sensors for interpreting the human-felt environmental state in an exposed non-urban landscape. By logging data on different days and taking note of the environmental conditions through video, still photography and written notes we were able to pick out the critical spikes in the sensor log files.

Our inferences in-lab about how the sensors would interpret effective sky state were checked by our field trials. For example, we planned in-lab to detect strong and sudden gusts of wind. After examining the sensor logs, and keeping in mind the way the skies had looked and felt, it was evident that our system would more reliably interpret a windy spell/day (as contrasted to a calm spell) than a sudden strong gust. We will examine the leaf wetness and solar radiation sensors in a similar way, determining what effective weather states are most reliably detected given the results of field tests.

We also used field-trials to test the impact of context sensing on story experience. Before the trials we composed several versions of the story engine explicitly for testing purposes. We constructed these test-versions to allow us to recalibrate sensors on the fly and screen story manually, in addition to triggering the scenes based on sensor values. This evaluation allowed us to experiment with the particulars of how weather and navigation could most successfully deliver story scenes. The trials prompted another round of style changes to story scenes.

As the development has moved forward, the nature of our critique has narrowed from broad scenario issues to more and more specific elements of the interface as we near completion of a fully featured prototype. We hope that this experiment will produce useful insights for more general mobile, location or weather-based navigation and entertainment applications.

3.2 Collect and Reflect

The handheld interface constitutes the first half of our intended system. When out in the wild, the hiker will use the device to help make decisions about where to go and will be treated to narrative elements that inform, entertain, and heighten awareness of the environment. But, at the same time, the handheld computer will also collect and locally store information about her location, the current weather conditions, the story segments she has seen and the queries she has made with the device.

The second phase of the interaction takes place when the hike is finished. Upon reaching an outpost of civilization, the hiker can upload the collected sensor readings via PC-based software. This interface will then allow her to manipulate the sensor data and reflect on the hike. The path she chose can be replayed dynamically on a map, the weather conditions can be visualized, and more media rich versions of the stories can be screened. This aspect of the device allows the hiker to create a personal record of her hike, reflect on decisions she had made, and plan future excursions.

This two-phased interactivity has an additional benefit as part of our ongoing iterative design. The sensor data provides us with a certain amount of information about how the device was used. But, more importantly, the personal record created by the hiker shapes this raw information into a form that reflects her experience [2]. We expect that replaying these dynamic records with the hikers will facilitate more focused and fruitful conversations about how the device was used and where it succeeded or failed.

4. CONCLUSION

The project is in the late stages of development as we move toward a user test that employs a full suite of sensors and a network of about twenty-five short movie sequences. We will evaluate the success of the stories' ability to augment the reality around the user, and the ability of the landscape to augment the story. We'll examine the log files for information about how and when the hiker queried the interface. We will evaluate these subjective characteristics through open discussion with the user test participants after their day/days spent wandering Cape Clear Island with the Nature Trailer system.

We imagine that the hiker will use the navigation tool to aid in decisions about where on the island to travel, and that the interface will encourage exploration. We anticipate that the context-aware features of the stories will engage the hiker in a new way in both the landscape and fictional movie scenes. A trial with hikers unfamiliar with the system is needed to challenge these hypotheses. There will inevitably be surprises resulting from a user test that we could not have concluded before hand.

We plan to use the results of this test in future design iterations of both the stories and the navigation tool. Additionally, we aim to develop a post-hike entertainment application, which uses the logged details of the hiker's time on the island to provide media rich supplements of the stories and places she experienced.

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