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Non-linear Story-telling in a Mobile World

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Abstract: Story-telling has been a means of bequeathing knowledge since aeons. Whereas the idea of the story-telling remains unaltered, the world around undertakes continuous changes. New media, new technologies and devices, new ways of communication define a new format of the story-telling. This paper proposes a new non-linear version of mobile story-telling in the emerging ubiquity of knowledge sharing. To support our concept we provide a description of multimedia services based on the MPEG-7 metadata standard used for our non-linear mobile story-telling environment.
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1 Introduction

Information sharing via story-telling is an ancient concept. Over centuries of development and evolution the story-telling method has not lost its power in a changing world. As one would expect, how stories are produced (media used) and consumed have changed. But the underlying intention to stimulate knowledge sharing and learning – the basic idea of story-telling – has remained unaltered. In today's computer technology era, also the story-telling approach gets its new digital face. Joe Lambert writes in [Lambert 07]: "The digital context makes testing a particular music in the video much easier than in film and analog media, and so experimentation is encouraged. You may find that, by going against the expected, you create another layer of meaning that adds depth and complexity to your story". Further on he stresses: "Digital storytelling is an opportunity to repurpose existing material to tell a story.".

So, story-telling can be seen as an approach to developing learning histories [Roth and Kleiner 99] by creating knowledge hyper stories [Royrvik and Bygdas 02]. Another more important application represents knowledge sharing and learning in communities of practice [Wenger 98]. Moreover, digital story-telling intertwines semantic knowledge and episodic knowledge. For example, already reified concepts of communities stored as documents are linked with the narrative experiences gained from episodic knowledge. This combination of semantic and episodic knowledge serves for saving of situational context.

A story can represent either linear or non-linear sequence of actions. In a linear story, the plot is completely specified during story creation. Thus, the author

prescribes a linear path, while the user will have to follow in order to consume the story. Consequently, each part of the content is meant to be seen or heard in the same order every time. The only main.pdfinteractivity allowed to "jump" back or forward on the navigation path. Obviously, for the modern application of story-telling linearity is restrictive. The use of digital media for story-telling makes stories more effective (combination of various media types) and interactive (management by different users). Such stories strive for the creation of many branches.

We re-visit our approach and adapt it to current trends in mobile computing. Mobile phones, PDA, guidance systems, interactive white boards, etc. make the new way of human-computer interaction possible. Mobile story-telling offers flexibility and mobility for media interaction. This requirement on story-telling has been already recognized by projects like VIEW [Kuner 08] or InStory [CITI 08] providing story-telling on mobile devices for different media types. However, the stories in those systems are linear only. In the related work, another trend in story-telling is to combine stories with video games. For instance, Mateas and Stern chose dramas as the original stories to create video games in a narrative way [Mateas and Stern 05]. It is a successful attempt in applying the concept of soap-opera onto video games. Virtual story-telling is another project developed at the Institute ZGDV in Germany to combine story-telling and virtual reality technologies [Iurgel 05]. Story-telling can be also applied in software engineering. In the project CONTICI (www.contici.org) the story-telling concept is used to trace the evolution of requirements presenting not only a communication medium for project community, but also a perfect learning resource.

In this paper, we show the importance of non-linear story-telling in the mobile world. We are relying on the formal definition of the MOD approached specified in [Spaniol et al. 06a]. The rest of the paper is organized as follows. In Section 2 we will present an application scenario of mobile story-telling to demonstrate the needs of non-linearity on the way to ubiquity. In Section 3 we discuss how the proposed concept can be realized, with regard to the technical specification of the existing services. The paper closes with conclusions and an outlook on further research.

2 Scenarios and Concepts of Mobile Story-telling

Imagine that you are visiting an unacquainted place destination. As a tourist, you have possibly prepared for the trip by getting a tourist guide in order not to miss anything. However, those guides do not offer any flexibility and merely provide limited information. One can try to overcome this restriction by printing out some information found in the web. How reliable is the information from a great variety of opinions given by users? Obviously, the best-fit advice might come

from your friends, colleagues, generally speaking, your communities. However, we can never be prepared for everything in advance. It is even not practical to taking a heap of papers with you in trips.

An appropriative solution could be some prevalent electronic small devices which can work like flexible tour guides, e.g. smartphones, PDAs, or iPhones. For example, some electronic guides like iGuide already exist [iTour 08] being capable of providing information of certain sightseeing places in cities or of artifacts in museums. However, they are similar to paper guides and provide different predefined routes. In case of getting unexpected free time in a foreign city, tourists might be in an even worse situation due to the lack of time for preparation. Very recently, the news about that Nokia has acquired Plazes (http://plazes.com) as well as the new release of iPhone stress the combination of location and communities.

We propose the concept of mobile story-telling. In the information retrieval aspect, tourists get a mobile access to the information about the routes that others have already taken, the places they have visited, the pictures they have captured. Barely nobody denies the usefulness of the stories from other travelers in the same communities, because interest and hobbies might be similar. Considering the problem that there are much fewer people who create information than those who use it, we have solutions in the information creation and information annotation aspects. We found that one of the reasons of such a phenomenon is the complexity restricts the recreation process of people's experiences. Usually, people get the possibility to upload trip pictures, to describe them, and to express their opinion, etc. only after coming back home from trips. Unfortunately, the impressions pale, the information gets forgotten. Consequently, the wish to share decreases, while the time span increases. Thus, mobile story-telling on mobile services provides ways to mobile media annotation and story establishment. In the information repurposing aspect, a non-linear story with different branches can be created based on input, if there is more than one member in your community who previously visited the same city and created a story about his/her trip. In the information monitoring aspect, GPS coordinates of the required services (e.g. picture capture, semantic annotation, information retrieval, etc.) during the trip can be monitored and used for story-telling. If two service requests were close to each other in terms of position, they were attached to one node of the story tree.

Moreover, using GPS tourists can start their virtual tour of the real life tour at any node of the already existing story which lies next to the current coordinates of the user. The detailed specification of the non-linear story creation is as follows. Adjacent media nodes $action_i$ and $action_{i+1}$ on a path are monotone regarding coordinates, i.e., $action_i(x, y, z) < action_{i+1}(x, y, z)$. This restriction makes the tour reasonable and time independent. As the parts of different stories

are attached to one node, again the location is explored. However, the context of a tour has to be considered. If the route was created for pedestrians, the distance of 5 kilometers will take an hour of walking and only 10 minutes by car. Thus we have to define a restriction $action_i(x, y, z) - action_{i+1}(x, y, z) \leq v_{max} \cdot (time(action_i(x, y, z)) - time(action_{i+1}(x, y, z)))$, where p is the geographical position and v_{max} the estimated maximum moving speed in the tour.

3 MPEG-7 Based Media & Story Management

In order to realize the proposed tourist guide using the mobile non-linear storytelling concept, those web services which were developed in our previous research can be further used. They are also used in some other platforms such as NMV and MIST.

The Nillenposse Media Viewer (NMV) provides a wide range of image editing and annotation functions (cf. Figure **??**, right). Users can tag, upload and search any type of media e.g. images and videos. Besides plain key word tagging and free text annotation, semantic tagging is also applied in NMV containing explicit definitions for the meaning of a tag. Each semantic tag represents one of the *Semantic Base Types* Agent, Object, Place, Time, Event, Concept, or State defined by the MPEG-7 standard.

NMV provides image tagging methods, i.e. using images to describe other multimedia including images, videos, etc. Moreover it allows the search for plain keywords by Boolean expressions as well as a search on the semantic tags of a medium. For instance, one can search for media whose keywords match the expression `‘‘Buddha’’ or ‘‘Bamiyan’’ and not ‘‘Religion’’`. Therefore, NMV enables the creation and management of the semantical knowledge of the story.

The NMV platform runs on the client side, representing the front end of the LAS environment [Spaniol et al. 06b] providing both user and security management. Users can receive permissions or prohibitions for certain services or methods and be merged to groups with common rights. Moreover, each object managed by the services can have specific access rights defined in so-called Access Control Lists. Since uploading, tagging and searching are implemented in LAS services, it is possible to check whether users are permitted to perform these operations. In particular, one group can also tag the same media with different annotations from another one, depending on their needs and habits. NMV presents a good service for media management, which is also implemented on mobile devices like Nokia N95 [Klamma et al. 07].

With regard to the data storage, images are stored on a FTP server. Videos are uploaded to a streaming server in the way that download and replay can be conducted synchronously. The metadata of the media is stored in a condensed version of the MPEG-7 XML scheme [ISO 02, ISO 03] in an XML database.

For the creation of non-linear stories we use the Movement Integrated Story Telling (MIST) service, which was intended to realize the combination of the objective *semantical knowledge* and the emotion-oriented *episodic knowledge* (cf. Figure **??** left). The process of story creation is split into a general part in which the plot is created and a detailed part in which the actual media is integrated. The available media base is the same as the one used by NMV, i.e., the semantic tags integrating the semantical knowledge into the story can be used, whereas the raw media represents the episodic knowledge. The paradigm of Movement Oriented Design (MOD) is the key structure of the stories created in MIST [Sharda 05]. Its basic idea is that each story consists of begin (describing a problem), middle (explaining the problem), and end part (solving the problem). Each of these parts can be decomposed recursively into *Central Story Units*. The result tree has the actual media as the tree leaves. Due to some restrictions of the Begin-Middle-End completeness, authors can define a successor relation among media which has to comply with the following general rules which ensure a reasonable story flow. *(a)* Each media instance is reachable (except the start media of course). *(b)* All successor relations are valid in the sense that begins are (optionally) followed by middles and middles are followed by ends of the same story unit. *(c)* Each story unit contains at least one begin, one middle and one end media instance.

Considering the graph in Figure 1, we recognize a story with two story units 0 and 4 and six media instances associated with begins, middles and ends (B, M, E). The arrows represent (valid) successor relations according to the MOD paradigm. One could not insert a successor relation between m_{MB} and m_E because of an incomplete Story Unit. Edges between m_{ME} and m_M (both are middle part media) and m_{MM} to m_E (middle and end part medium do not belong to the same story unit) are not allowed, either.

Because of both aspects, the story creation and its consumption, are implemented in the same application. Two main panels are realized, denoted as *Editor* and *Player*. The editor provides three windows: the story plot with its problem hierarchy, the detailed story editor for actual story creation and a panel which lists all employed media and the related tags.

The media player on the other hand shows a list of all possible successors for the last visited media instance and a tree of all problems treated by this media instance, whereas in the main panel the medium itself is displayed as in NMV.

Currently, stories – or linear subsets – can be exported into two file formats. One path can be selected and exported to the SMIL format [W3C 08]. This can be used for advertising a story for instance. Another opportunity is to transform the whole story into the base of an E-Learning adventure game where the media is used as game backgrounds and the successors serve as transitions. Certain XML documents and a game engine are in use [Moreno 08].

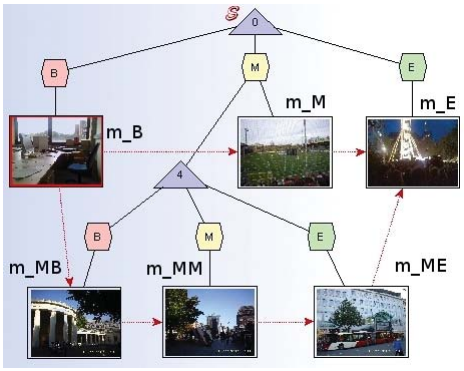

Figure 1: A Simple Story in MIST

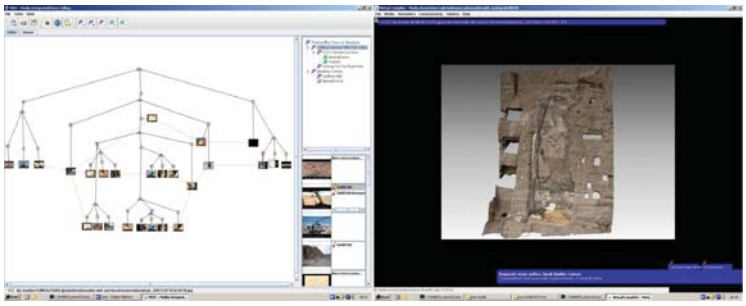

Figure 2: Annotated concept map

Yet, no complete mobile MIST version has been developed which is the only barrier on the way to the touristic guide in form of mobile non-linear story-telling. The design of mobile version of MIST is a challenging task. The restrictions of the mobile devices have to be considered to assure application usability.

Moreover, we will use a *Mobile Service Oracle for Success*(MobSOS) that measures the success of mobile multimedia community services [Renzel et al. 08]. As MobSOS tracks time and position of the service call, it can be applied for supplement the user action with additional semantical information. When taking pictures with NMV mobile, for instance, a tracked tour can be exported to the KML format used by Google Earth [Google Earth 08], providing the images and the tagged information as well. Figure 3 shows the interface of NMV mobile on the right-hand side and monitoring data displayed in Google Earth on the other side. The position information collected by MobSOS will be used to trace actions with close locations, which is the core idea of the aimed story-telling structuring.

Figure 3: Pictures in Google Earth Tagged with the NMV Mobile Interface

4 Conclusions and Future Work

In this paper, we have presented a new evolutionary step of our story-telling environment MIST to its mobile non-linear version. We describe a concrete scenario to demonstrate the usefulness of our approach. Furthermore, we defined three already developed and deployed services. The mobile versions can be further integrated to get our proposed system later. In this paper, the current technical realization and the core concepts of each service were sketched.

We are currently working on the full mobile version of MIST. The media annotation tool is already implemented for mobile use and it produces media needed for the mobile story-telling approach. We are catching on many restrictions of mobile devices. We are performing a user-oriented conceptualization phase for the mobile MIST environment. Thereby, also the experience gathered during the development of MobSOS will be useful.

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