Formalization and visualization of the narrative for museum guides

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Abstract. There is a wide range of meta-data standards for the documentation of museum related information, such as CIDOC-CRM; these standards focus on the description of distinct exhibits. In contrast, there is a lack of standards for the digitization and documentation of the routes followed and information provided by museum guides. In this work we propose the notion of the *narrative*, which can be used to model a guided museum visit. We provide a formalization for the narrative so that it can be digitally encoded, and thus preserved, shared, re-used, further developed and exploited, and also propose an intuitive visualization approach.

Keywords: Narrative, Narrative Segment, Guided tour, Documentation, UML, Constraints, External media, Visualization, Museum guide

1 Introduction

There are currently more than 19000 museums in Europe and even more archaeological sites [13]. And given that the preservation of cultural heritage is at the very core of the foundations of the European Union – the Lisbon treaty, a constitutional basis of the European Union, states that the Union "shall respect its rich cultural and linguistic diversity, and shall ensure that Europe's cultural

heritage is safeguarded and enhanced" [14] – it should come as no surprise that in the period 2007-2013 alone the EU invested a whooping 4.5 billion EUR in cultural heritage and related research.

Much of that has been directed towards digitization, producing a vast amount of digital documents. Tellingly, Europeana connects more than 50 million objects from over 3 thousand institutions, a number that continues to rise as more institutions become involved and more collections are included [15][16].

So far we have achieved maturity in documentation standards for museum content [2], with CIDOC-CRM standing out [1]. We also have at our disposal a wide range of supporting end user environments and data storage systems. As such, most museums currently possess standardized digital documentations for their collections; these documentations are often interconnected at the regional, national, or even pan-European level via Europeana.

However, there is an important aspect of museum related information that is still being overlooked by documentation standards: the design and delivery of the overall museum visit experience. This refers to the type of information that museum guides use to serve their visitors, and that makes the best museum guides stand out from the rest. As we will explain, this information, that we will call herein *narrative* is valuable, expensive, endangered and unexploited. With this in mind, in this work we shall propose a formalization for this type of information, allowing for museum guided visit plans to be documented, stored, shared and re-used. In order to maximize the utility of our proposal, we look at the narrative from the perspective of the expert that designs and delivers it, rather than the perspective of the system that stores and handles it.

The remaining of this paper is structured as follows: In section 2 we explain why we examine the value of the information regarding the museum guided visit. Continuing, in section 3 we follow a museum guide's approach to the design of a visit, which leads us to the specification of a typology of museum visit segments in section 4. Of course, this is not the end. It is just the beginning; in section 6 we discuss what we have learned from the early experience with the application of our approach, how we plan to move forward and what the future entails. Section 7 lists our concluding remarks.

2 The value of the narration

Museum exhibitions are, more often than not, masterful works of art and study. Archaeologists study the collections of the museum producing vast amounts of scientific documentation. They also work hard to identify and select the most important, most telling and most complementary items to put on display. Then museologists study the selected items and their documentation, take into consideration the architecture of the space as well as the characteristics of the expected audience, and design the exhibition. Everything, from the placement of each exhibit, to the accompanying short text, and from the direction of the light to the most probably route a visitor will follow, are carefully thought out in order to provide the best possible museum visit experience.

All this is included in the price of the entrance ticket, and everyone who has entered the museum can enjoy it at no additional cost. Still, visitors find it reasonable to pay additional amounts for the services of a museum guide; clearly, these visitors acknowledge that the guided tour, with all the carefully selected bits and pieces of stimulating information, and the guide's captive performance, adds **value** to their overall experience.

But how does the guided tour come to be? Its basis is information that is already publicly available, most commonly in books, some times also in on-line sources. A museum guide will go through vast amounts of information about the items on display and will make a selection of what to present. This selection will typically consist of fine a balance of "important" archaeological and historical facts, entry level archaeological observations to facilitate involvement, anecdotes and even jokes to break the flow of scientific information and avoid mental overload and links to the audience's background, profession, age group etc to stimulate engagement and reflection. And then, after every distinct delivery of the content, the museum guide uses the direct or indirect feedback of what worked well with the audience and what did not, in order to further enhance the guided tour for the next group. Overall, a museum guide's plan for a visit is something that starts with many hours of study and planning and is further developed over a longer period of time. It is therefore an **expensive** good, the creation and refinement of which require considerable resources.

Most guides start with a core text of their narration, in the form of a typed document. This document is printed out, and although not always visible to the audience is typically readily available to the guide. At the end of guided tours, particularly after the first times that a narration is used, guides will add handwritten notes about possible enhancements to the content itself or even the way it is delivered. Over time, these notes become the guides' most cherished and valuable professional property, as it is these notes that allow them to delivery their guided tours, serving as the script of a performance that is planned to the detail. But this script, in its refined form, is typically available in a single printed copy with additional handwritten notes. And thus, it runs the **danger** of being destroyed, stolen or lost. And even if the script is not lost before that, it is certainly lost when a museum guide retires.

The information documenting each exhibit separately, or a collection as a whole, is typically stored in a standardized, digital form. Thus, it can be searched, shared, reused and/or combined with other sources. It would be very interesting to be able to perform similar actions based on the narratives. For example, it would be interesting to be able to search for exhibits that are chosen for tours of specific topics, or to automatically identify the most popular items. As long as the narrative is not standardize and non digital, this information cannot be harvested and further **exploited**.

In summary, the way things stand now, the narrative of guided tours has a great value and is expensive to develop, but it runs the danger of perishing and it is not being fully exploited.

Related works in the field focus more in aspects such as (a) content editing and resource management for narratives (e.g. the Storyspace platform [7]), (b) digital and informational enhancement of narratives (e.g. [8]), and (c) educational goals and performance (e.g. [9], [10]). These aspects related to the notion of the narrative are nonetheless rather important. However, we notice the lack of focus on a documentation format for the representation, preservability and interchange of narratives.

Motivated by these observations, in this work we set out to specify an extensible documentation format that will allow narratives to be digitally encoded, and, thus, preserved, shared, re-used, further developed and exploited, while they retain their original structure, their educational goals, their various constraints, and their relevance to external resources.

3 The narrative

A good museum guide is a combination of many things. An educator, that educates the audience about the content and value of the observed exhibitions; a performer, that delivers a presentation in a lively and captivating manner; a psychologist, that is able to detect and adopt to the moods of the audience. And, most importantly, a museum guide is a contractor, that provides guided tours under a strict and unforgiving constraint: time.

Any other deviation may be forgiven, or even go unnoticed; but regardless of what happens between the beginning and the end of a guided tour, the overall duration of the tour must always be exactly what was agreed and what the audience - who are also the paying visitors - have purchased.

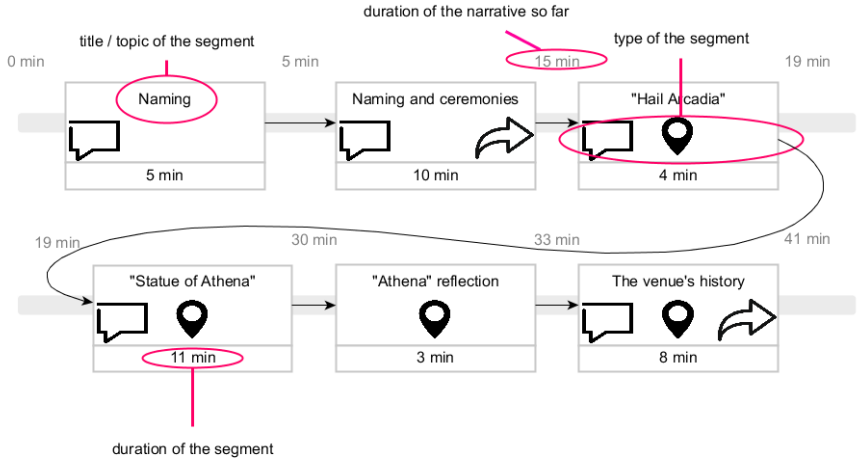

Fig. 1. The general structure of a museum visit guide's notes

Thus, when setting out to design a new museum tour, the guide starts by developing different segments, such as specific exhibits of interest. The narration of the respective presentation is written to every detail, tested and timed, so that the guide knows the exact duration each segment requires.

Finally, the guide strings together the different segments in a convenient sequence, for example taking into consideration the physical location of the exhibits. Depending on whether the overall duration is too long or too short, the guide may edit the narrations or even add or remove segments altogether.

The final design of the tour is a well scripted scenario of a sequence of steps. An intuitive way to visualize the narrative is shown in figure 1. Here the narrative is depicted as a sequence of boxes, corresponding to segments, each one readily displaying the most important information about it: the type, topic and duration. The cumulative duration up to each segment is also displayed, as this is the most important information for the museum guide at the time of the delivery of the guided tour.

The full description of the narrative also includes the goals or learning objectives, in the case of education oriented tours, the constraints, such as not suitable for rainy days if it is for an outdoors venue, the audience characteristics, such as maximum size of group, typical ages, countries of origin, cultural background etc, and the bibliographic sources the narrative is based on.

In the following section we examine in more detail the different types of segments that a museum guide may consider, their characteristics, and the way to visualize them.

4 Segment typology and visualization

A segment is a part of the narrative which accomplishes a certain sub-goal (i.e. *title*) of the narrative, in a given time frame (i.e. *duration*); it is performed under certain conditions and it can be characterized essentially by three main attributes:

- the rendition of a self-contained narration fragment (hereafter *narration*),
- the presence of a certain exhibit or point-of-interest (hereafter *exhibit*), and
- the requirement for the participants to physically move in order to proceed with the itinerary (hereafter *movement*).

The *narration*, *exhibit*, and *movement* attributes are essentially orthogonal. Their presence or absence can vary independently and their combinations represent respectively varying situations during a narrative. Thus, we have the following eight possible types of segments:

- Narration and exhibit. This is the most commonly used segment. It corresponds to the narration delivered while observing an exhibit.
- Only narration. This is a typical segment for the beginning of the narrative, where an overall introduction is given before the actual tour of the exhibits starts.

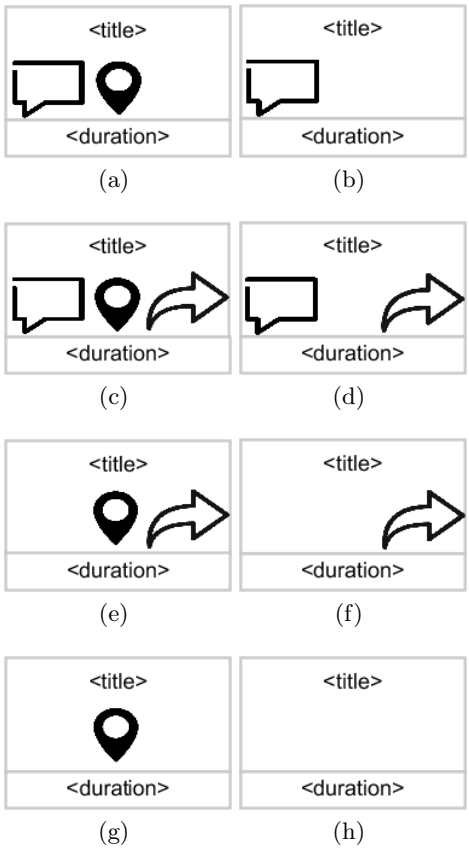

Fig. 2. Types of segments

- Narration, exhibit and movement. When presenting considerably larger objects, as for example the outside of a temple, the guide may talk to the audience while walking with them so that they can see it from different sides.
- Narration and movement. Guides will sometimes talk to their audience while moving between sections. This is more common in outdoor tours where distances between different points of interest are bigger.
- Exhibit and movement. Similar to the narration, exhibit and movement combination, this type of segment is typically used in outdoor setting, when the guide moves the group so that they can observe a larger object from different points of view.
- Only movement. The most common way to move between different sections is by having the audience follow the guide. Moving in this manner is considerably faster than, for example, the combination of movement and narration.
- Only exhibit. This is when the guide gives the audience some time to observe an exhibit.

– None of the three attributes. This is a valid segment that is used in guided tours of considerably longer duration. It corresponds to a break.

These combinations can offer valuable information at a high-level design of a narrative. We utilize the expressiveness of the three attributes to visualize a segment and, by extension, a narrative.

We visualize a segment using a rectangle box. If the given segment involves narration, we add a chat-bubble shape at the bottom-left side of the box; see figure 2(b). If the segment should be performed at a certain exhibit, we add a point-marker shape at the bottom-center part of the box; see figure 2(g). And, if the segment requires movement, we add an arrow shape at the bottom-right side of the box; see figure 2(f).

We have chosen three visually discrete portions of the segment box (i.e. bottom-left, bottom-center, and bottom-right) as placeholders for the respective attribute glyphs in order to emphasize on their orthogonality and to facilitate the visual existence or absence of each attribute.

As we saw in the previous section, the top of the rectangle is used to depict the title/topic of the segment and just below the rectangle we depict the expected duration. In addition to these, the full description of a segment may also include the text of the narration, supplementary visual aids that may be used and their timing in the narration, constraints and, optionally, the goals or learning objectives. The bibliography upon which the narration has been based may also be noted.

5 UML representation and XML specification

Following the description of our core concepts of *narrative*, *segment*, *narration* and *narration part*, we have designed a UML class diagram that illustrates their relationships and includes the mandatory information for their definition.

A narrative is initially defined by a title, educational goals, a description, the language of its content and the venue at which it may take place. Additionally, it may contain descriptions of its accompanying bibliography and a set of constraints.

A narrative must include an ordered collection of narrative segments. A *segment* is a partially autonomous part of the narrative that it may represent various types of steps in a narrative trail, the way we presented in 3. As such, it may be defined primarily by a combination of an exhibit, a narration performance and/or a movement requirement. Additionally, it should have a certain duration and it might be marked as optional (i.e. it may be skipped in certain performances). A segment may also include its own specific bibliography. A segment may define its own set of constraints or constraint overrides to the overall narrative (e.g. inaccessible exhibits due to restoration processes, or due to weather conditions in semi-open venues).

In our proposed formalization of narrative, the narration that may be performed during a segment is composed by certain *narration parts*. A *narration*

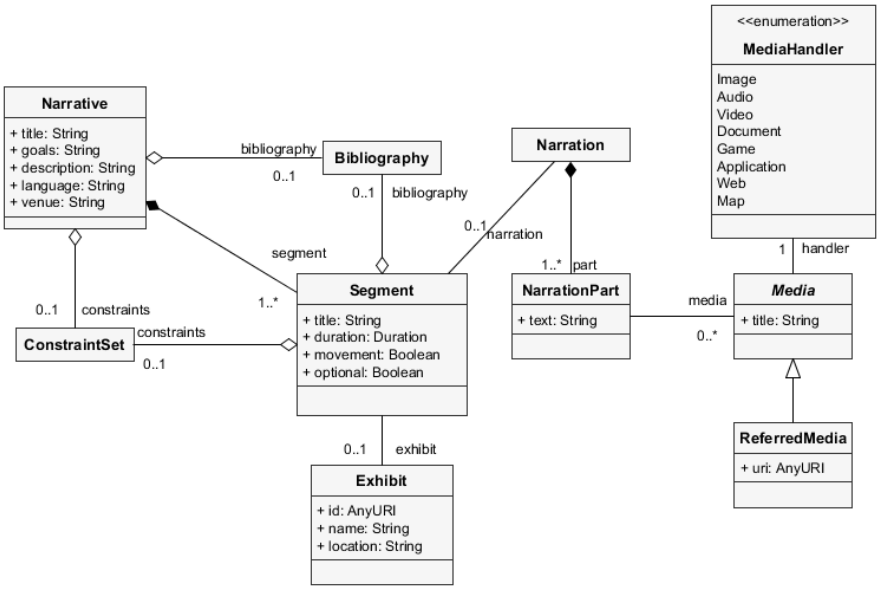

Fig. 3. UML class diagram representation of narrative's core concepts

part, in its simplest form, may contain a certain part of the text that a narrator would perform. The whole text of the narration may be divided in more than one parts in order to be precisely related to external *media* (e.g. images, audio, maps, web-pages etc.), that may frame it.

What follows naturally is the specification of a structure or format for the encoding of the narrative. The UML class design of the narrative has been the guide for the specification of the respective XML schema. We have actually already developed an XML based syntax, described in XML Schema Definition (XSD).

The XSD schema comprises three files,

- `narrative.xsd` which contains the definitions for `Narrative`, `Segment`, `Narration` and `NarrationPart` elements,
- `types.xsd` which contains the definitions for general types such as `Bibliography`, `Media`, `Exhibit`, `Author`, etc., and,
- `constraints.xsd` which contains the extensible definition for `Constraint` elements, and utility types such as `ConstraintSet` that represents a certain collection of constraints, and `ConstraintDomain` that acts as a semantical package and namespace of constraints (e.g. physical environment constraints, audience constraints etc.).

We do not include the detailed schema here because (a) it is rather trivial and uninteresting given the detail of the description of the structure and contents given in sections 3 and 4 and (b) the size of the schema file makes it impossible

to include it in this paper. The interested reader can refer to the file on our site: `http://gav.uop.gr/docs/ikc2017files/`.

6 Lessons learned and the way forward

Although we sincerely believe there is a utility in the visualization approach described in the previous sections, especially in narrative flow and time management, we do not see it as the core contribution of this work. What we feel brings the most potential is the structuring and formalization of the narrative.

We have been applying our approach in a real life setting in the context of the CrossCult project [3]. The CrossCult project aims to help European citizens understand and perceive their common past and present in an holistic manner, while fostering retention and promoting reflection. To this end, the CrossCult project adopts guidelines formulated in recent research [5][6] regarding the design of the interactive experiences and their narratives. With narratives being such a central part of the project, we were in need of a way to describe narratives, as well as of a way to quickly review and compare large numbers of them; hence the motivation for this work.

A standardized, simple and structured formulation of the narrative makes it easier to share but also to co-develop narratives. The digital format also allows for searches that were not possible before, such as "which exhibits are visited when discussing ancient medical practices?" or "which exhibits are shared between most guided tours?".

When it comes to the visualization, we notice that, simply by observing the visualization of the narrative, it is quite easy to identify the route that the group will follow. Thus, by quickly reviewing the visualizations of all the active narratives at a given time, one can easily identify a) points where congestion might occur and b) parts of the museum that are less visited; this last part can be used to select areas to use for additional activities or to specify which other narratives could be activated without a problem.

What is perhaps more telling of the potential, is the fact that the digital storage of the narrative has permitted us to use the same narrative, unaltered, in three different contexts:

- In the project's native tablet application.
- Delivery by a human guide (figure 4(b))
- In an experimental setting using Google Cardboards (figure 4(a) and [4])

And any feedback received from either of these application settings is used to update the joint narrative, thus also reflecting upon the other application settings as well.

Moving forward, our first plan is to develop a graphical user interface, based on the visualization approach presented herein, to enable the documentation of narratives from the guides themselves, without the need for technical support. Based on that, we may see larger numbers of documented and digitized narratives, a trend we hope will one day lead to open source narratives.

(a) (b)

Fig. 4. Different modes of delivery of the same narrative

7 Conclusions

In this paper we focused on the valuable, expensive, endangered and vastly unexploited treasures of the narratives of guided museum tours. We proposed a formalization for the narrative, that directly leads to its digitization, and an intuitive visualization.

Both have opened new ways: the visualization in the direction of understanding how the narrative works in the space of the museum and co-exists with other narratives and the formalization in the direction of storing, searching, sharing, co-editing and re-using the different settings and contexts.

Closing, we should mention that term "narrative" have been used before, in the setting of games and storytelling [11][12], but with a different meaning than the one considered in this work.

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