



EDUCATIONAL ENHANCING OF VIRTUAL EXPOSITIONS. TOWARDS VISITOR-CENTERED STORYTELLING DIGITAL MUSEOLOGY

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ABSTRACT

We present here some basic ideas and functions of a system developed for cultural, scientific and technical mediations of a good quality but still affordable adapted storytelling. The adaptation concerns mainly the topic variety and the knowledge deepness. In the first part we discuss the origins of the storytelling approach, its interest in mediation tasks; we also handle the problem of transformation of some narrative functions into operational categories of analysis by means of adequate metadata. In the second part, we give some elements of the knowledge organization underlying such a system and precise the notions of learning profile and of point of view, for a case study concerning a video-based presentation of a Renaissance painting; in our case, we distinguish three profiles and nine points of view. We then give some examples illustrating the capacity of the system to build abundant adapted stories about the chosen painting; we also argue in favour of the local-ontology construction, which supports the whole system, both at the back-and the front-office levels. We finally conclude with some educational enhancements we currently develop (storytelling generalization containing complementary mediation modes, as Problem Resolution and Serious Games, integration of stereoscopic 3D videos, intelligent track of an end-user during her/his reading process as well as customized contextual assistance to her/him reading goal).

KEYWORDS: digital museology, storytelling, cultural and educational mediation, adaptive systems, variable deepness knowledge representation, user profile, points of view, ontologies, reading and interpretation strategy

1. INTRODUCTION

Since at least two decades, storytelling stimulates, and this rather intensively, countless innovating ideas in the broad field of cultural, scientific or technical mediation. Education and cultural/scientific heritage are equally addressed. There are of course efficient and final causes for such a state of affairs (Aristotle, *Physics*, II, 3, 194b 23-195b 21, *Metaphysics*, IV 2, 1013a 23 sq.). As semiotic consumers, can we say, we definitely are beings of narration. Presumably, because our modern thought and, generally, our modern culture, have never been deserted by their mythic origins (for instance: Vernant 1990, 2006; Lévi-Strauss, 1995, between others.). In various domains, where mediation becomes a central affair (Lamizet 2000, Guillaume-Hofnung 2011), education, museology and generally, cultural and scientific heritage, we progressed (or retro-progressed), moving from reason to myth. We discovered both the myths of our reason and the reasons of our myths.

Storytelling stands nowadays more than a concept: in fact, it became a genuine productive tool facilitating knowledge acquisition, fostering interpretive and problem solving abilities, allowing rich sharing of cultural experiences... To put it briefly: a powerful means supporting, sustaining and refining our need for comprehension. In all models and applications, storytelling appears as a major vector of knowledge and culture transmissions. Myriads of projects give statistical evidence of a new epistemological conscience, which corresponds to a well-identified shift in storytelling cultural economies (Bedford 2001, Leinhardt et al. 2002, Puhol et al. 2013; Filippini-Fantoni 2004; cf. also the European project *CHESS*).

Certainly, as a practice, storytelling goes farther than conventional textual narration; it splits up quickly into numerous species engaging enaction, interaction and diverse participative activities, both individual and social. It appears nowadays as an all-purpose rationalizing method, certainly of an unbalanced and nomadic nature, but still

operational, where fissures of significance, incongruities, interruptions, multi-level associations, plot reorientations, etc., are still possible, plausible and even essential in serving understanding, transmission and sharing of meaning. One expects various added values in exploit it in research and development of systems aiming at facilitating cultural, scientific and technical mediation.

Natural and motivational, definitely efficient, storytelling protocols are nevertheless laborious. For a large-scale development, they become even unaffordable, as far as they have to be adapted to various reception modes, to unequal cognitive skills, to different horizons of expectations and, generally, to diversified noetic requirements.

Astonishingly, even in the heart of a profound economical crisis, the cost of such developments seems less interesting for academic research. But the storytelling problem turns, anyway, and critically, into a problem of adaptive low-cost industrial design. It better emerges as an industrious, systematic but realistic endeavour: is it possible to build refined storytelling alternatives that fit to different reception capabilities expressed by different semiotic consumers?

Behind of such a plain formulation, one immediately understands the productive challenge; it reformulates the need for a respective, wide-ranging, popular, and perhaps self-governing or even autonomous access to knowledge and, generally, to culture (Braz 2011, Bourdieu 1979, Caune 2006).

Based on some previous experiences concerning profile-adapted thematic virtual museums (Kanellos 2009, or The Annunciation virtual museum, for instance), our contribution concerns, precisely, the outline of a project we currently develop concerning a system that allows cost-effective conceptions and uses for differentiated narration scenarios. The intent is to satisfy various demands of storytelling. More generally, the system aims at furnishing a flexible platform able to set up virtual presen-

tations of an item (or a theme) or of a collection of items (or themes) for different visitor profiles, for different learning goals, and for different educational levels; in other words, for different reading and interpretation strategies.

Here applied to an art history case study, the system supports actually any virtual exposition logic. Such logic is significantly augmented with adapted “intelligent”, assistance in reading and interpretation, allowing alternative comprehensions of the exposed material. Moreover, the system offers various observation enhancements that may lead to more refined meaning appropriations.

In a certain sense, through adapted storytelling, such a system tries to grasp the progress in understanding as a progress of accommodated narration: the object or theme is presented under a tailored form, fitting to defined reception capacities and expectations.

2. KNOWLEDGE ORGANIZATION FOR MULTIPLE STORYTELLING: FUNDAMENTALS

In a theoretical lineage traceable to narratology and, more specifically, to the study of (Propp 09), the system we present substitutes to the notion of *narrative function* the more operational one (for a presentation) of *point of view*. A point of view defines a particular approach on the subject, using categories of thought that are broadly irreducible to the remaining points of view (for instance, aesthetics, contextual support, comparative approach, hermeneutics, etc.). A narrative unit is seen as a concatenation of partial “stories” (all of them worked up under the same linguistic register), addressing some points of view (topics) concerning the subject. In our case study, dealing with a painting (*The Flagellation of Christ*, by Piero della Francesca, ~1455, Galleria Nazionale delle Marche, in Urbino, Italy), the elected points of view are basically seven:

- *Description*
- *Author*

- *Context*
- *Documentation*
- *Aesthetics*
- *Technical Information*
- *Interpretation*

For a complete and somehow natural presentation, we added to this list an *Introduction* and a *Conclusion*; they also can be seen as points of view, rising the total number of points of view to nine.

The number and the nature of the points of view are not mandatory: different storytelling conceptions usually necessitate different points of view. The back-office of the system we develop (indexing module) offers a convenient environment in order to define an arbitrary number of points of view, customizing various conceptions on exposition.

Each point of view is divided into consecutive deepness levels, which correspond to reception refinements; they address equinumerous user profiles. Clearly, one can imagine an unlimited list of profiles. The notion of profile seems necessary, as far as the requirements for comprehension, and thus, for analysis, may differ a lot from a learner to another (see, for instance, (Arasse 2005)).

We limited our study to three profiles, somehow emblematic in the cognitive literature (corresponding to stages in knowledge acquisition):

1. *amateur* (that implements general public demands),
2. *confirmed* (addressing needs of an academic student) and
3. *expert* (satisfying scholar requirements).

Profiles are indexed to local ontologies and design levels of apprehension ability. For instance, contrary to what is laid down in the CHES project (cf. above), where profiles are rather informal and correspond to sociological and/or educational categories of museum visitors, in our case, profiles, are defined formally as guides to planning by-level learning requirements.

All contents we deal with are video sequences, lasting from some seconds to sev-

eral minutes; each of them furnishes matter to particular aspects of the painting. (The total duration of all these sequences is about one hour.) Clearly, the nature of these contents is unintentional: any multimedia resource may be used instead.

In the light of these principles of analysis, the entire storytelling material is partitioned off, giving rise to a two-dimensional matrix, where levels of refinement (profiles) cross points of view (topics with adapted narrativity). Any exposition (of the concerned object or theme) is actually a choice function over this matrix.

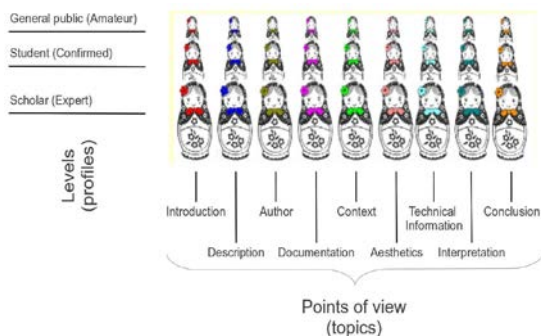


Figure 1: Points of view are topics on the subject. Levels stand for profiles.

As far as a particular exposition invokes at least one point of view and one profile, in our rather limited case study (with 9 points of view and three deepness levels), and excluding possible narrative permutations (i.e. narrations made up from the same set of video sequences but in a different order), the system can generate more than 250000 by-topic and by-profile customized “stories” ($4^9 - 1$ more precisely) for this particular painting of Piero della Francesca.

3. INTERACTION FEATURES

For a better comprehension of the use, we give in this section some elements concerning the interaction with the interface. Our illustration takes aim at a front-office user (typically, a professor composing a course for a class, a curator preparing an exposition, or even a student or a museum visitor wishing to learn more about a subject). Clearly, in this case, we suppose that

all points of view and all profiles are upstream defined; and that the whole base of video resources is available. Figure 2 gives a snapshot of this end-user interface.

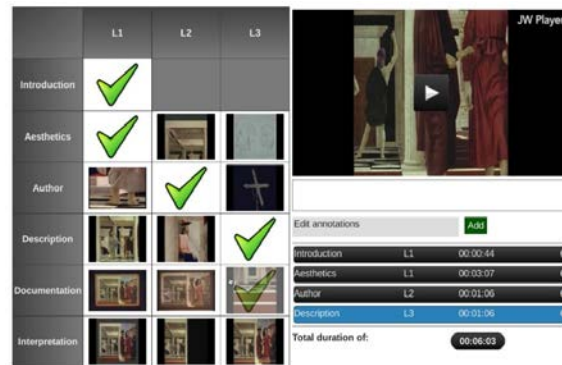


Figure 2: Left: choice of the video resources through the Profile/Point-of-view matrix. Right: video player (above) and storytelling editor (below).

Aiming at setting up her/his exposition or presentation, the user picks out the story components from the matrix, by adjusting their nature and level to her/his target auditory (left). Narrative coherence is resolved upstream, when conceiving the resources. The most natural and, perhaps, low-cost way is to design profiles inclusively, i.e. so that the L+1 includes the L profile and is included in the L+2 profile. A textual summary offers quick information on each resource that can also extensively be viewed through the player (right). Selected resources can be edited at any moment through the storytelling editor, below the player (giving, thus, a global “plot” organization). Complementary metadata furnish information about the point of view used, the profile concerned, the duration (of the atomic video resource or of the global exposition/presentation storytelling already built), etc.

The user may also “augment” this story by adding her/his own comments. An annotation editor allows such possibility (Figure 3).

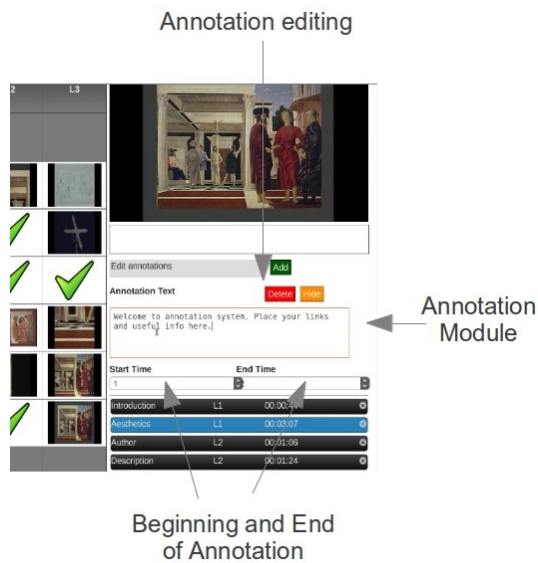


Figure 3: Annotations may be added at any narrative moment of the story under construction.

Annotations may be viewed at the same time with the video sequences. They supply comments and, generally, complementary information to the global story already built.

3.1 Visualization. Sharing and social contributions.

Once the global scenario is completed, it may, of course, be viewed and/or be saved as such. Authorized persons (students, visitors...) can then view the “storified” version that presents the object/theme to their level and goal.

At any time, it is possible for the designer of the presentation (teacher, curator, etc.) to come back and (re)edit the story already built. At any time, it is also possible (when modification rights are provided) to take an existing story (made up by someone else) and slightly transform it in order to adapt it to some new reception goal.

On the other hand, the system offers possibilities for sharing the storytelling experience both in building and in viewing.

This last leads us to give some hints about the back-office of the system.

3.2 The knowledge organization

The knowledge base supporting the system is an aggregation of local ontologies,

each one corresponding to a specific point of view.

Figure 4 gives a contracted version of the Aesthetics ontology (the number of concepts of this point of view is about 200).

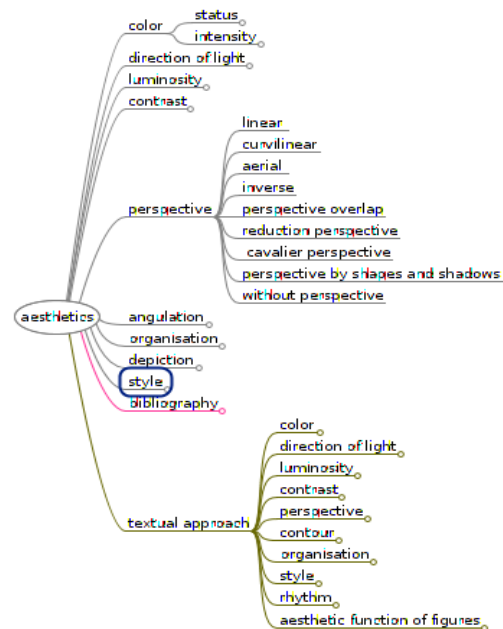


Figure 4: Part of the local ontology corresponding to Aesthetics point of view.

In our case, the total number of concepts for all points of view is about 2000. The hierarchical ontology mode is based on a partial order relation for optimization reasons (large-scale thorough performance). The tree structure of such ontologies gives ground for low-cost indexing processes based on similarity features of the items concerned by the presentation or the exposition (in our case, paintings).

The back-office user is a key-user insofar as she/he determines the operational categories that will support, downstream, storytelling creations. Besides indexing facilities, the system allows to define arbitrary (in nature and number) points of view and profiles. Ontologies need, of course, to correspond to these definitions that fix the conceptual framework and the targeted public of the foreseen customized presentations or expositions.

4. FURTHER WORK. CONCLUSION.

The project we briefly presented is actually a part of a bigger project that aspires to develop a “Builder” for general-purpose virtual expositions.

So far, we presented the narrative part of the system that roughly corresponds to the storytelling initiative in presentations. But, as we had already the opportunity to mention it, storytelling may also embrace alternative modes of knowledge transmission, essentially learning by projects and other general active pedagogy techniques, gaming, etc. The two-dimensional matrix we saw in section 2 is then complemented by a third dimension, where one defines alternative pedagogical modes.

Any narration mode may invoke, therefore, corresponding activities.

A second direction of research and development concerns the integration of stereoscopic 3D videos. Indeed, more and more, both, the e-class and the e-museum, open to new stereoscopic technologies that reinforce motivational traits through enactive features.

We presently work on some extensions of the system we presented, taking into account such possibilities.

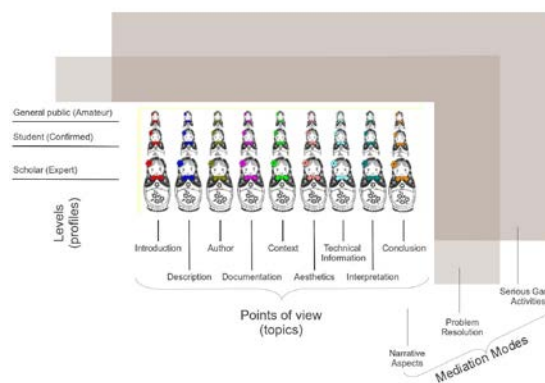


Figure 5: A storytelling approach composing with various mediation modes (especially Problem Resolution and Ludo-Educative Activities).

Finally, a third direction concerns the elaboration of a semantic model of the student/visitor in order to track her/his activities in using the platform in order to render to her/him contextual relevant assistance for profile-adapted learning. The ontologies we presented are essentially thought out with this goal in mind.

In some few and rather resuming terms, the storytelling affair is, in effect, a powerful paradigm to conceive and develop solutions that renew the transmission of knowledge and culture in our digital area. The system we try to set up answers to a generalized demand merging cultural, scientific and technical mediation techniques in an integrated storytelling based platform.

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