Mediterranean Archaeology and Archaeometry, Vol. XX, No X,(20xx), pp. xx-xx

Cultural and Educational Mediation meets multimedia-based adaptive storytelling. A profile-sensitive system for personalized presentations.

Antin, Rica Simona[1]; Kanellos, Ioannis[1]; Houssais, Antoine[1]; Transon, Alan[1]; De Bougrenet de la Tocnaye, Jean-Louis[1]; Grenier, Damien[2]; Curt, Jean-Baptiste[1]; Tritas Aris[1]; Caroff, Anne-Gabrielle[1]; Meillerais, Romain[1]

[1]Institut Mines-Télécom / Télécom-Bretagne, Brest, France
[2]École Normale Supérieure, Rennes, France

Received: dd/mm/yyyy
Accepted: dd/mm/yyyy
Corresponding author: ioannis.kanellos@telecom-bretagne.eu

ABSTRACT

The paper proposes a highlight of a system giving advanced functionalities for setting up presentations of general form (although educational and cultural mediations are privileged). In the first part we introduce to the importance of underlying narrative, with a quick state of the art on storytelling and its power in rendering interpretation techniques salient and promote understanding. In the second part we give brief descriptions of the basic functionalities assumed by the system (the creation of the presentation fulcrum, the construction of a presentation, the implementation of an intelligent module that increases a presentation according to different profiles and the indexing/research module). We then discuss quickly some evaluation results and conclude with the contributions of the presented approach.

KEYWORDS: storytelling, adapted presentation system, educational and cultural mediation, grains and grain composition, points of view, depth levels, rhetoric variants, narrative functions.

1. INTRODUCTION : STORYTELLING AS A GROUND AND AS AN OBJECTIVE

In this paper we present the advanced stage of a project already introduced at VAMCT 2013.

The aim of this work is to set up a system able to support multiple cultural and educational mediations, built up mainly using 2D (and even 3D) granular video units. Central, video units are not exclusive: multimedia resources of different format (as images, texts, sound recordings, etc.) can also be used. The general purpose of such resources is to support various presentations (for instance, different types of courses, exhibitions, expositions, etc.) that fit multiple profiles of recipients. These recipient-focused virtual presentations could be appropriate and operational to almost any topic (whether it is artistic, scientific, technical or even commercial).

The project recognize two kernel practices and therefore two main user categories: the mediation tutor (who sets up a mediation strategy or proposal; typically, a curator, a professor, etc.) and the mediation addressee (who takes benefit of the mediation activity, by receiving what the mediation tutor proposes; typically, a visitor, a spectator, a student, etc.).

The mediation in question takes the form of a presentation, through a dedicated storytelling. Telling stories about a subject (a theme, a situation, a fact, a work, etc.) is a main goal in mediation, as far as storytelling seems to be foundational for human cognitive needs. Many reasons sustain the interest, both educational and cultural, of a system assisting users in constructing and sharing (at least, in the sense of presenting) stories. Storytelling seems to be inescapable in knowledge and, more generally, culture transmission.

Indeed, stories have always been and remain an essential form of knowledge despite their end, announced as imminent by several authors. For instance, the global semiotic approach of (Barthes, 1984, pp. 63-69) announces "the death of the author", while the post-structuralist (Lyotard 1979), criticising modernity, argues on the end of the "metanarratives". Men need to produce and to consume myths, and even to believe in myths, perhaps because the human cognition is structured as a discourse. Furthermore, it is generally admitted that men are well established into an economy of stories, which guarantees them to remain human (Citati, 1999, pp. 8-14). Man is a "narrative"; in his experience in the world and in his relationship with others it rather tells and tells stories. As the neurologist (Sacks, 1985) notes: "A man needs such a narrative, a continuous inner narrative, to maintain his identity, his self." This "myth-making function", this ability to relate and telling, seems to be a fundamental factor in the development of the human being (Molino & Lafhail-Molino, 2003). For (Jacob 2011), the story is part of the human cognition, playing a role as the Chomsky's language conception; "the narrative system" (equally important as the digestive or respiratory system), has the ability to furnish storytelling compentence and performance. (Dennet, 1988) thinks moreover that, it is, above all, a matter of conscience (being aware means having the power to tell stories). In other words, building, receiving and telling a story means a construction of knowledge about oneself, others and the world.

As far as the mediation is concerned, a system able to give support to story setting-up and story presentation contributes, undoubtedly, to enhance culture and knowledge transmission. In this case, the added value of mediation is obtained from storytelling practices. In other words, the mediation places the subject (the object, the theme, the idea...) in an interpretive-narrative register that catalyses the set of significances one wishes to transmit and validate.

As a matter of fact, any subject (object, theme, work...) is already a narration, in the sense that it is something that comes with "a narrative charge", which addresses its dependencies to numerous contexts and, therefore, associated representations and interpretations. In the case of educational and cultural mediation, a system of "narrative construction" would therefore function as a promoter of representation and interpretation exchanges. Telling is always telling something on the basis of a horizon of expectation; this is the real foundation of "narrative contract". Storytelling could thus be seen as a modality (or a figure) of mediation that introduces a communication pact, with the goal of allowing people to seize a subject (an object, a theme...) symbolically. Through this narrative pact, the "reader" should better (easier) grasp the meaning gap, and access to personal appropriations.

In a digital era, as ours, it is trivial to observe that voice and written text can be enriched with digital documents. It is not the nature but the function that makes it possible to maintain the storytelling pact. Indeed, whatever they are, such documents have to ensure "grain function" and be arranged in a certain presentation order, with a stated narrative goal. The "digital story" has, moreover to demonstrate narrative and interactive capacities: i.e. to allow the user to generate alternative stories through repeated interactions. The system we set up gives evidence to such forms of interaction.

In our attempt to create a "narrative storyteller system", we based our vision on narratology studies. The issue of "universals of narrative" has been the

subject of intensive research work. The works of (Propp, 1970) are certainly emblematic. They analyse the concept of "function" where one can find the basic element in systematization of the narrative construction (applied to the case of (Russian) fairy tales, in his works). A function is "the action of a character, defined in terms of its significance in the unfolding of the plot". The character's function is the "fundamental part of the tale" or the "elementary link" in the building of a plot (or scenario), called also "ground" or "element". Through this link, Propp studies the law of interchangeability: "the characteristic of tales is that the components of a story can be moved to another tale". Moreover, even if the succession of fundamental functions is generally the same, the absence of some of them does not imbalance the narrative structure and does not change the arrangement of other functions.

This allows, therefore, freedom in the narrative structure: firstly, all functions are not mandatory for how the story works and makes sense; secondly, a function can be removed (in order, for instance, to be embedded into another tale). For (Bremond, 1973), the story is not a "fixed sequence of functions", as Propp suggests, but rather a "logic of possible narratives", put forward by the different bifurcations of the story and by the constant choice between these possible series of narrative. In other words, a storytelling is a dynamic structure, that evolves according to continuous rectifications that adapt it to a given communication pact.

2. MODELLING THE STORYTELLING PROCESS

This last has a crucial implication in the modelling of the system we propose. Indeed, from these two theoretical perspectives (Propp and Bremond), we retain the importance of the possible arrangements of narrative functions, assumed by multimedia grains, in the context of the narrative strategy pursued for a case of mediation ("narrative contract" imagined or concluded with the reader).

More formally, our modelling goal was to offer a system able to intervene on the narrative structure of the story, in order to promote a free construction of the reading (and furthermore, the interpretation) path. The narrator (at the position of a mediator) must have the opportunity to freely propose a non-linear story; he must have the opportunity to insist on a detail, to highlight a theme, to emphasize some parts of the story (those that remove ambiguities, those that make the story readable or those that help in understanding the whole story); and all this, by a careful selection of the grains he considers necessary for the construction of the story.

2.1. The grain matrix as the cornerstone of the presentation variety

Thus, an important innovation of the project is the concept of "elementary grain", which stands as the fundamental mediation-oriented unit. The grain is, somehow, the element which updates a narrative function. Cornerstone of the intended storytelling, a grain presents an indivisible narrative autonomy. Technically speaking, the grain is actually the smallest content that can be found in a database of resources, available for any user found in the position of a presentation creator. It is a (generally) small reusable unit, interchangeable, manageable, depending on user's presentation target. Grains can be reshaped and assembled in many ways, almost endlessly. However, the project focuses on the customization of these grains and gives to the user specific benchmarks for organizing the whole content. By the combination of grains the system allows the construction of a compositional narrative structure, which supports various mediation rhetorics.

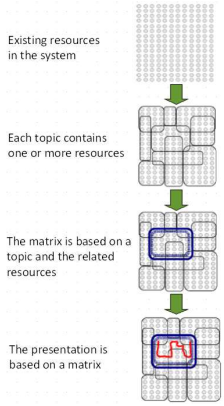

Figure 1: The structural succession: resources, topics, matrix and presentations. Resources are gradually organized according to the themes they belong to. For a theme, one can construct one or more matrix (i.e. templates), that represent the basis of the presentations to be created later. A matrix supports several narrative routes (and thus, presentations).

The system is actually an authoring tool that allows the reuse of grains in the creation of different presentations. This is done in two steps:

Firstly, the mediator-user constructs a "matrix of grains", containing:

- a list of points of view (each point of view proposes an (ontologically) different analysis of the topic engaged in the grain);
- a list of depth levels (levels allow the gradual discovery of the proposed subject, depending on the degree of difficulty or refinement of grain's content);
- a list of rhetoric variations (grains may have the same coordinates "point of view/depth level" in a matrix; but still propose different

ways of dealing and/or presenting the same subject).

The matrix represents somehow the operational corpus of grains on which a particular presentation will be founded (it is a part of the back-office of the system, as far as the creation is concerned). It is a working space or a "reading guide" supporting a variety of presentations. It gives ground to various storytellings. It is also an interpretive context, exploitable for one or more interpretations, defined by the designer of the mediation. His/her mediation intention determines the content of this workspace, in relation to the addressed domain and public.

The system supports an arbitrary number of such matrices of a great flexibility: indeed, it is possible to define as many points of view and/or depth levels. In each cell of such a matrix, the designer of a presentation slips one or more "grains" (a video, a sound recording, an image, a text) that are upstream indexed by type, name and domain. When the matrix is completed, it enables to create a set of presentations freely tuned according different profiles and objectives.

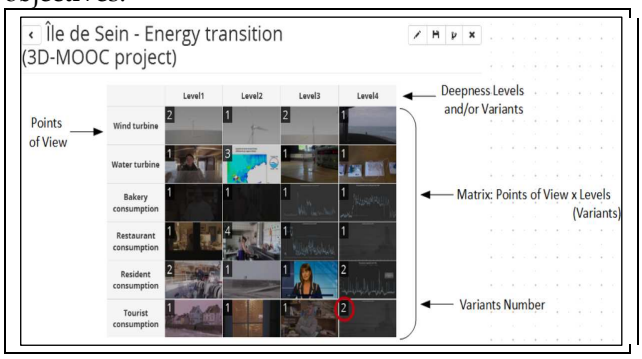

Figure 2: Matrix setting up.

Secondly, the mediator-user specifies what the final presentation will be. The presentation is the privileged place to realise an adapted interpretive act. By combining the resources picked up from the matrix in a linear order, one can create multimedia playing lists supporting (or even replacing) (dis)courses.

2.2. Setting up a (guided, semi-guided or free) presentation

Each presentation remains within the framework of the matrix defined (is a selection of grains over this matrix). The user chooses the grains of interest and sets up incrementally the presentation he wishes (possibly readjusting their order). Moreover, he can import original resources (not already existing in the library) and integrate them in a purpose-built space, common with other users.

When creating a presentation for an audience, it is possible to propose a double reading list: a main presentation (let us say, containing basic, mandatory knowledge that has to be selected first), and a suggested presentation (containing enhancements, or alternative routes to undertake in order to deepen the study).

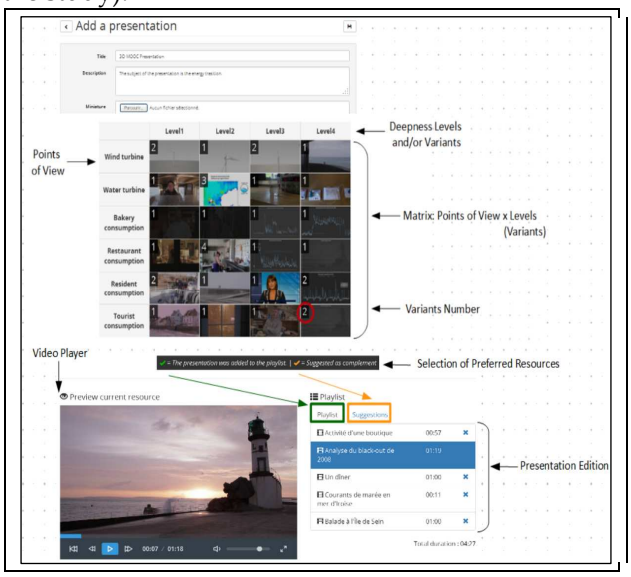

Figure 3: The creation of double reading list is based on a large combinatorial capacity of the grains contained in the matrix. Each list contains at least one possible story.

The mediation addressee (i.e. the presentation recipient) is not reduced so some passive spectator. A specific completion algorithm is implemented allowing him to refine or to extend an initial presentation adjusting it to her/his needs or to the story that (s)he wants to receive. Such complements are generated contextually, on the basis of what the user has already viewed. The purpose is to provide rationally support giving the opportunity to any addressee to complete actively, gradually and consistently her/his reading path. The major challenge is to point out the aspects that (s)he could miss during the presentation, by redirecting her/his attention and interest towards these aspects. Also, to help her/him to target, accurately and rather quickly, the contents (s)he considers relevant (or just interesting) for her/him.

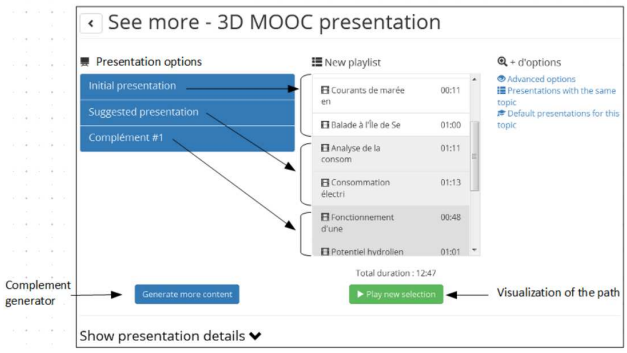

Figure 4: Choosing the preferential route. The recommendation system offers several supplements, in addition to the initial presentations. At each click a new supplement will appear in the play list, made up from grains that complement (refine or extend) the already viewed grains.

2.3. Indexing and (multi-criteria) research solutions

Clearly, any user must have the possibility to seek grains through the library. In order to satisfy this need, the system design provides an internal search module. The logic of the search engine is designed in order to establish a tight correspondence between the user search needs and the internal organization of knowledge without (local ontologies corresponding to the considered points of view) so that her/his search is fully optimized.

Tables should have one paragraph space before and one after.

Figure 5: Multi-criteria search. To perform a multiple research, we can simultaneously select two or more points of view and several categories and subcategories. The visual representation is in the order of the choices made. In this example, two videos were found using multi-criteria search.

Indeed, the whole system is rooted on a specific knowledge structure. To model a domain, a dedicated module allows to create and edit the knowledge structures underlying any content organization. Furthermore, the system allows the definition of attributes and relationships between elements of the structure. These structures are the basis of the indexing procedure and give grounds to the search module. Generally, each resource is indexed by type (video, text, audio, image), by name, by point of view and by level of analysis. This ensures internal consistency and promotes the adaptability of the system, in terms of architecture, layout and content.

In the current development phase, the library contains resources from several fields: architecture, painting, geology and environment. The application example that we present here concerns a scientific and a cultural mediation, addressing presentations for museums or courses, etc. In the first case, we target the subject of energy transition, a crucial subject in various scientific presentations; in the second case, we are concerned by a fine arts case, the *Judith and Holofernes* theme. Given the difficulty of access to the meaning wealth and complexity of such subjects, these subjects lend themselves well to an individual and intelligent assistance exemplifying the interpretive power of the system.

3. EVALUATION

An interpretative argument gives evidence to our approach. The project goal is to stimulate users' motivation and to foster their interpretative skills in the study, observation or exploration of a work, an object or a theme. The aim is also to provide a narrative and effectively interactive digital story structure that opens toward mediation and understanding.

The developed device facilitates mediation by allowing refined tunings of the levels of explanation, the analysis categories and the addressed topics, so that each addressee can enjoy an genuine and personalized experience. The storytelling is used here as a general method to highlight the importance of a permanent reflection on the meaning, essential in cultural and educational transmission. We stipulate that almost any theme (any ideas, object, etc.) can be studied through such a storytelling support, using a reading grid like the one we propose. The kind of rationalization the system offers provides benchmarks for the organization of knowledge and the progress in reading and understanding.

Indeed, it is what it was shown through 4 different evaluations we made. The two initial were done in a school environment (secondary school and high school), and the evaluators were the professors. Their critiques allowed us to enhance the functionalities of the system (for instance, in implementing grains logic to illustrate or highlight points that nourish a speech created in the interaction with the students or in giving the possibility for the users to import resources from outside the system and to build an adaptable course, etc.).

The third one has done in the university, in a class of Master in Cultural, Scientific and Technical Mediation. There we tried to evaluate the universality

of the approach. Students were asked to apply the system to any domain and them they wished (they chose topics related to history, painting, advertising, photography, etc.). All of them found the system quite practical and applicable to a mediation intention.

Figure 6: Matrix on the Apple brand. Example of system uses for marketing purposes (design: Isabelle Thiébau; HST master of the UBO, 2015).

Finally, a more technical evaluation has been made, concerning the functional, ergonomic and pedagogical parts of the systems. It has been performed in our institution, with 23 persons (students and/or professors). They had to effectively use the system in creating a presentation and answer to 28 questions of a MCQs test (for instance, some questions were about the usability of the system (Q9: "Are the system functionalities helpful?"), other about the educational applicability (Q16: "Can the system support different educational paradigms (such as flipped classroom, MOOCs, Lecture, etc.)?") and others referred to its social acceptability (Q22: "Do you think the system is socially acceptable (for teachers, mediators, students, parents, etc.)?")). The answers we obtained gave a positive (4/5) or very positive (5/5) appreciation for almost all questions (with scores varying from 75 to 95%).

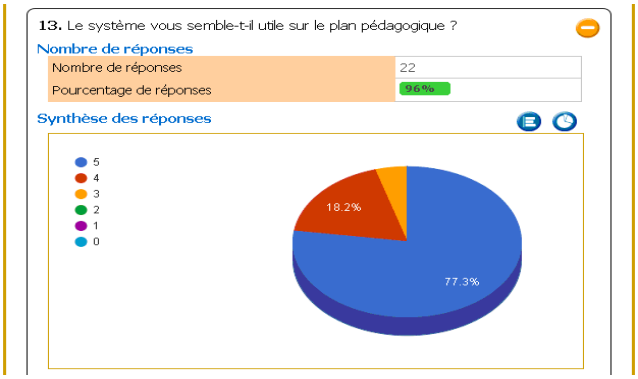

Figure 7: Analysis of the results reveals that the proposed environment is perceived as useful (4/5 for 18,2%) or very useful (5/5 for 77,3%) in different pedagogical contexts.

4. CONCLUSION

In sum, through its flexibility, the system allows combination and interchangeability of "narrative grains". It guides the creation of adapted presentations (exhibitions, lectures, courses) and consultation of resources. It can also effectively supervise the observation, study, deepening, etc. of the targeted themes. Moreover, the system gives to a studied theme a systematic aspect, making it appear more accessible; it also demystifies it and makes it more understandable. It can be used both in a school setting (primary, college, high school or university) and in a broader cultural context, such as museums, libraries or any cultural institution that deals with some form of mediation. It can also be used as an adaptive extension for SPOCs (Small Private Online Courses) and even for MOOCs, upgrading them to 2.0 forms, i.e. rendering them able to integrate reusable social contributions, balancing the roles of tutor and student.

ACKNOWLEDGEMENTS

This work was partially achieved for (and funded by) the 3D-MOOC project, a project within the framework of "Cominlabs", of the European University of Brittany (UEB: http://goo.gl/SynPWn).

REFERENCES

Adam, J-M.: *Le récit*, Paris, PUF, 1984.
Barthes, R.: "Introduction à l'analyse structurale du récit", in *Communications*, n ° 8, Paris, Éditions du Seuil, 1981.
Barthes, R.: *Le Bruissement de la langue, Essais critiques IV*, Seuil, 1984.
Bedford, L.: "Storytelling: the real work of museums", in Curator 44(1), 2001, pp. 27-34.
Bouchardon, S.: *Littérature numérique, le récit interactif*, Paris, Lavoisier, 2009.
Bremond, C.: *Logique du récit*, Seuil, 1973.
Bruner, J.: "Life as Narrative", in *Social Research*, vol.54, n°1, 1987.
Citati, P.: "Nous avons besoin des mythes pour rester des hommes", in *Télérama*, n° 2561, (10.02.1999).

Denett, D.: "Why everyone is a novelist?" In *The times Literary Supplement*, September 16-22, 1988.
Doering, Z. D.: "Strangers, Guests, or Clients? Visitor Experiences in Museums", in *Curator: The Museum Journal*, vol. 42, no 2, April 1999, p. 74-87.
Faucheux, M.: "Les technologiques : technique, récit et médiation", in *Mises en récit de la technique : regards croisés*, Paris, Éditions des Archives Contemporaines, 2011.
Genette, G.: "Discours du récit", in *Figures III*, Le Seuil, Paris, 1972.
Gergen, K. J.: "The social constructionist movement in modern psychology", in *American Psychologist*, n°40 (3), 1985, pp. 266-275.
Jacob, S.: *Histoires de s'entendre*, Montréal, Boréal, 2011.
Jeanneret, Y., Souchier, E., Le Marec, J.: *Lire, écrire, récrire: objets, signes et pratiques des medias informatisés*, Paris, Bibliothèque Publique D'information, 2003.
Lebrun, M., Smidt, D., Bricoult, G.: *Comment construire un dispositif de formation*?, Paris, De Boeck, 2011.
Lyotard, J.-F.: *La condition postmoderne*, Éditions de Minuit, 1979.
Molino, J., Lafhail-Molino, R.: *Homo Fabulator, Théorie et analyse du récit.* Actes Sud, 2003.
Propp, V.: Morphology of the Folktale, Paris, Éditions du Seuil, 1970.
Rabatel, A.: Homo Narrans, pour une analyse énonciative et interactionnelle du récit, Lambert-Lucas, Limoges, 2009.
Rastier, F. : "Sur l'immanentisme en sémantique", in Cahiers de linguistique française, 1994.
Ricoeur, P.: Temps et récit 2, Paris, Seuil, 1991.
Sacks, O.: The Man Who Mistook His Wife for a Hat and Other Clinical Tales, Summit Books, New York, 1985.
Selander, S.: "Designs for learning: a theoretical perspective" in *Designs for Learning*, vol. 1, n°1, mars 2008, p. 10-22.
Tilden, F.: *Interpreting our heritage*, University of North Caroline,Carolina Press, 1957.