A MULTI-VIEWS REPOSITORY FOR MULTI-STRUCTURED DOCUMENTS

Karim Djemal
IRIT, SIG/D2S2 Team, Paul Sabatier University 118 Route de Narbonne, 31062 Toulouse, France

Keywords: Document repositories, meta-model, multi-views, multi-structured document.

Abstract: The diversity of use of digital documents has created new interests on archiving, storing and accessing the digital documents. These documents can have several structures and different interpretations of these structures. This paper presents an approach to process the multi-structured documents through repositories. So, we present the repository meta-model based on views. Integrating various views in a document repository allows a complete vision and a better targeted exploitation of these documents.

1 INTRODUCTION

The recent growing of digital documents and in particular the audio-visual ones has created new interests on archiving, storing and accessing the information extracted from these documents. Thus, document repositories were used to allow an easy and efficient exploitation of documentary information. Indeed, the document storage provides a detailed description of the structure as well as contents of each document stored in the repository.

This description is used to represent immaterialized documents and to gather documents that have the same structure in order to lead to possible analysis. These documents can have several structures and different interpretations of these structures. So, each document can have several views. These views are generally related to a particular case of use of a document. Moreover, in the literature, a "view" can have two meanings. It can focus on a certain aspect of the studied entity and in this case it presents a vision corner, or it can include all the aspects of the entity within an interpretation and in this case it presents an opinion. In every instance, the view concept introduces a use or an interpretation dimension which allows to give semantics to the various structures.

This paper presents an approach to process the multi-structured documents through repository. The use of the views is a way of managing these documents. Integrating various views in a document repository allows a complete vision and a better targeted exploitation of the documents.

This paper is organized in two sections. The first one describes related works regarding a modeling muti-structured document and metadata usage for media description. The second section exposes our approach to process the multi-structured documents within a repository. We start by introducing our proposal that includes a modeling a multi-view repository. Afterwards, we show an example of the instantiation of our meta-model.

2 RELATED WORK

A document repository contains the document (i.e. granules of it) as well as the associated structures and content information. Indeed, to exploit the information extracted from these documents, it is necessary to represent and store these documents according to appropriate models. This information can be of complex nature (e.g. image, audio, video). Metadata are proposed in the literature to describe this information.

2.1 Modeling Multi-structured Documents

A lot of work has been done in the perspective of modeling multi-structured documents. These works can be classified into two categories.

(1) Work that uses conceptual graphs (made up by concepts) in order to represent the various structures. These concepts are already defined. EMIR² (Mechkour M., 1995) and EMIR² extended

Djemal K. (2007).
A MULTI-VIEWS REPOSITORY FOR MULTI-STRUCTURED DOCUMENTS.
In *Proceedings of the Ninth International Conference on Enterprise Information Systems - DISI*, pages 544-548
DOI: 10.5220/0002381505440548

models (Charhad M. et Quénot G., 2004) join this category of models. They represent the document like set of concept, which are connected in the shape of graph, thus forming a different structure.

EMIR² model presents an image description according a set view (facet). It combines various interpretations image in order to build a complete image content description. This model is based on conceptual graph to conceive these views. These facets are classified according two description levels:

- The logical level collects all views describing the image contents: structural, symbolic and spatial views,
- The physical level presents the perceptual view. It describes the low level characteristic of image.

EMIR² model was extended to include audio-visual documents. (Charhad M. et Quénot G., 2004) proposed to add two facets: a temporal one and an event one. These two facets characterize the specific dynamic aspect of this kind of documents. Temporal facet presents the temporal aspect of video documents. It permits to order and synchronize a dynamic content of these documents. Event facet describes several events produced in audio-visual documents. These events describe actions occurring in a video sequence.

(2) Work which represent the structures through elements and metadata which compose to them. These elements and these metadata are not already defined. Two types of structures arise: an arborescent structures representing the documents: case of the model of (Mbarki M. et al., 2005), and the graph structures representing the documents: case of the ISDN and MSDM models.

Within the framework realized within ISDN, (Abascal R. et al., 2003) proposed a generic model to manage the multi- structures documents. ISDN model defines, in a generic way, a multi-structured document specifying the relations between the various structures detected in the same document. (Chatti N. et al., 2006) extend this model to describe these relations. They propose a model called MSDM. This model organizes the various document structures and attaches them to a base structure.

The objective in these works is the modeling of multiple documents structures; and this is accomplished by allowing on the one hand, the integration of the structure as a whole, and on the other hand, the representation and handling of multi-structured documents.

As part of treatment of multimedia documents, (Mbarki M. et al., 2005) present a model which exploits two document structures; the logical and the semantic, and that offers a dichotomy between these two structures. Each document can have a logical structure composed by elements and their attributes and also it can have a semantic structure composed of components and metadata which describe them. Although it treats documents multi-media integrating of the complex data, this meta-model allows to manage only two structures of the same document simultaneously.

2.2 Metadata for a Semantic Access to Contents

Above, we have shown the possibility of structuring a document in various ways. In this part, we browse a particular structure: the semantic one. This structure offers a semantic access to the data through the metadata which it uses. Indeed, metadata (i.e., data about data) can be used to describe several aspects of content (e.g. formats, semantics, etc.). (Jokela S., 2001). In our works, we are interested in the semantic aspect offered by these metadata. So, by accessing these metadata, we can exploit semantics of a document by retrieving, interrogating and analyzing the contents.

In the literature, there are several metadata languages providing semantics of documents. In the following part, we show three languages: RDF, Dublin Core and MPEG7. These languages are based on XML syntax for the document description.

RDF (Resource Description Framework) provides a generic model for metadata. Coded on a triplet (resource, property and value), RDF implements a mechanism to share, exchange and use semantic information (W3C, 2004).

Dublin Core (Hunter J., et al., 1999) being a descriptive diagram of metadata, it is designed to express metadata on Web and to cover a wide spectrum of application. While being simple (usable by non expert) and flexible (possible to extend it), Dublin core offers, in the initial version fifteen descriptive properties (e.g. “Title”, “Subject”, “Description”, “Date”, “Type”, “Format”, “Language”, “Relation”, “Coverage”, etc.).

These elements were extended to describe audio-visual document. This suggested extension concerned mainly three elements: “Format” (to specify physical characteristics), “Relation” (to describe the hierarchical relationship of structure.) and “Coverage” (to locate the spatio-temporal segments to be described).

MPEG 7 (Multimedia Content Description Interface) (Manjunath B.S., et al., 2002) is a standard description, based on multi-media document metadata. It provides set descriptors (D) describing physical characteristics of the audiovisual objects (texture, movement, etc.), set of description

diagram (DS), an extensible DDL (Data Definition Language) and tools system. For example, MPEG 7 proposes tools for the content description according two aspects; structural one and conceptual one, like it proposes tools for the content management.

MPEG 7 and extended Dublin Core offer an overall description of the audio-visual documents. Dublin Core focuses on the bibliographical description of the data and it does not describe low level information. MPEG 7 standardizes descriptors of very low levels, although, it offers a mechanism of descriptors extension to generate high levels descriptors. RDF is characterized by the description of the resources and relations between them. Today, RDF seems to be the suitable language that can be coupled with our proposition including views management and their representation

3 MULTI-STRUCTURED DOCUMENT REPOSITORY

3.1 Meta-Model

In this section, we expose our approach; we show and exploit the multiple-views associated with a document, within a repository.

In order to take account of the multi-structured documents in repository, we propose a meta-model with multi-views (cf. Figure 1). This meta-model presents, in particular, the views that are associated to the same document. These views are developed by the elements and the associated metadata. In addition, certain views will be brought to exploit the relations between metadata or between the elements to have a specific characteristic.

This meta-model presents two aspects; a generic one, and specific one. In a first level, we treat the specific aspect of a document. More precisely, each document has a declaration, with its own physical and logical specific structure. The physical structure describes physical parameters of a document. As for the specific logical structure, it translates the organization of a document into several levels. It is composed of set specific elements which can be described by specific metadata. The specific logical structure then describes the role and the nature of each specific element like their hierarchies. This specific logical structure is attached to a generic logical structure. And, this generic logical structure is made up of generic elements which can be described by generic metadata. Logical structure could be interpreted according to several views i.e. elements and metadata which compose it. These views express a different point of view; they can then show the structural, semantic, spatial or temporal aspect of a logical structure.

- Structural view: built by the generic elements, it presents the structural aspect relating to a document making it possible to focus on its logical organization.
- Semantic view: only composed of metadata which describe certain elements. This view allows thus, the exploitation of certain complex elements (e.g. an image, a video sequence, etc.) while accessing their contents.
- Temporal view: composed by elements and metadata as well as the relations which could exist between the elements or between the metadata. This view allows to have a structure with temporal character with an aim of having certain individual uses in the exploitation phase.
- Spatial view: like the temporal view it is composed by elements, metadata and relations. This view focuses on the spatial characteristics of certain elements and metadata (e.g. for a geometrical form, we can associate the nature and the coordinates) like on the relations (e.g. the positioning of these geometrical forms or objects between them).

Allen relations (Allen J., 1991) allow to structure the contents of a video sequence based on temporal information. Indeed, Allen identifies a complete set of temporal relations that can to exist between two intervals. He introduced thirteen relations among which twelve are asymmetric (“Before”, “Meets”, “Overlaps”, “starts”, “During”, “Finished” and. “Equal”).

The spatial view is described primarily by the three relations: topological, directional and distance defined in (Charhad M. et Quénot G., 2004).

- The topological relations are described by the positions between objects: in front of, behind, etc.
- The directional relations show a particular orientation between the objects: right, left, above and below.
- The third type of relations is based on distance: near and far.

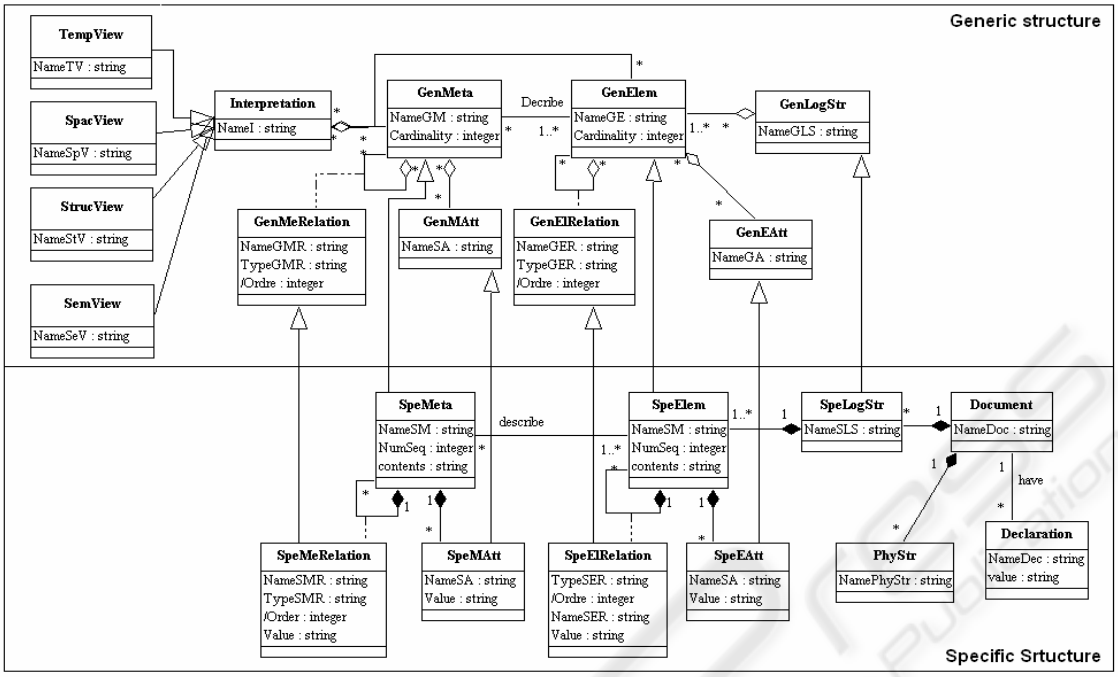

Figure 1: Meta-model of multi-structured document repository

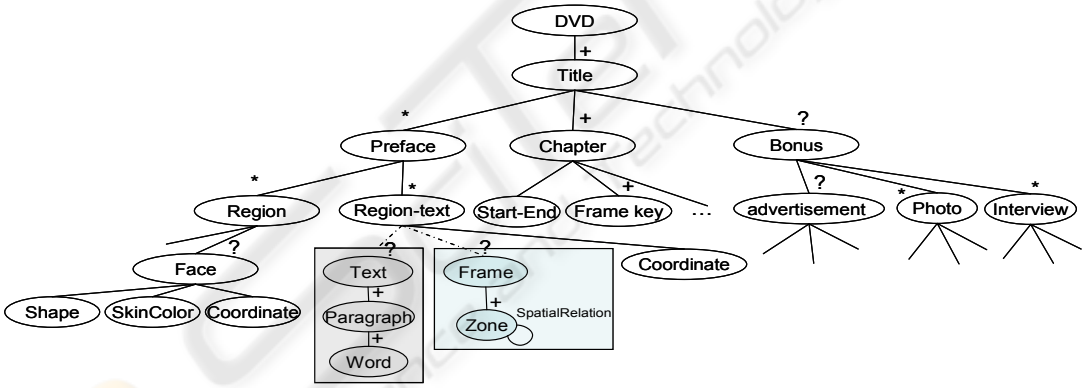

Figure 2: Generic structure of a DVD.

This meta-model allows to take into account various interpretations of the logical structures through the views. Indeed, the same element or the same metadata can belong to different views. This meta-model then allows the overlapping between views and consequently between structures. So, this solution also enables to store the contents of a document only once and each view can refer it. In consequently, it allows to eliminate the possible redundancies due to multiples storage from various elementary information.

These multi-views also permit to structure the document description on several abstraction levels. We will have then, the structural view in the low level, then the semantic view and finally both views; a temporal one and spatial one.

3.2 Example of Repository Content

To validate our meta-model, we propose to treat a DVD example. Indeed, by observing a collection of DVD we could extract a generic structure common to these DVDs. The Figure 2 shows this generic structure. Indeed, a DVD is composed of one or more titles. These titles can contain a preface, a possibly bonus or set of the chapters. The chapters represent index on film. They are characterized by their start and their end, and by their key frames.

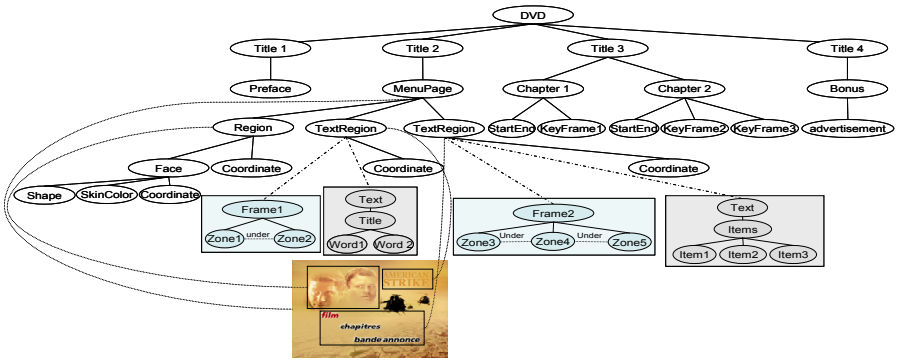

Figure 3: Specific structure of a DVD.

In our example, we develop in particular "Prefaces" element. This element can be composed of "region" and\or "text-region". This fragment is characterized by its coordinates. These coordinates depend on the region form (e.g. for a rectangular region, we define the Cartesian coordinates of the high left corner of the rectangle, as well as its width and its height). We present two different views associated to this element. Indeed, a text-region can be interpreted in two different ways. According to the use, a user can interpret it as an image and text. So, there will be two possible structural views "Frame Str" and "Text Str" to describe same elementary information.

4 CONCLUSION

We have presented in this article some related works of multi-structured documents, as well as of the metadata. After that, we show our approach. We present a meta-model of document repository and an example of repository content.

This paper proposes an approach of multi-structured documents management within document repository. The meta-model suggested allow jointly to manage several structures associated to the same document. On the one hand, our meta-model, unlike to the Mbarki's and the MSDN model, can manage various interpretations of each structure. On anther hand, our meta-model allows to store each document fragment only once and each document structure refers to this fragment, differently to MDSM model. Indeed, each structure represents a view different from the document and each view is made up of several fragments (elements and metadata). These fragments can pertain to more than view simultaneously. Consequently, this méta-model allows the overlapping between the views.

We aim, in our next work, to validate this approach by a prototype and to show a possible use cases of this repository.

REFERENCES

Abascal R., Beigbeder M., Benel A., Calabretto S., Chabbat B., Champin P.A., Chatti N., Jouve D., Prie Y. and Rumpler B., 2003. Modéliser la structuration multiple des documents. In *Actes de la Conférence H2PTM Hypertexte et Hypermédia -Créer du sens à l'ère du numérique*, Ed. Hermès, Paris, pp. 253-258.

Allen J., 1991, Time and time again: The many ways to represent time. In *International Journal of Intelligent Systems*.

Charhad M. and Quénot G., 2004. Semantic Video Content Indexing and Retrieval using Conceptual Graphs. In *ICTTA*, Damascus, Syria, 19-23.

Chatti N., Calabretto S. and Pinon J.M., 2006. MultiX: an XML-based formalism to encode multi-structured documents. In *Proceedings of Extreme Markup Languages 2006*, Montréal, Canada.

Hunter J. and Armstrong L., 1999. A Comparison of Schemas for Video Metadata Representation, In *WWW8*, Toronto.

Jokela, S., 2001. Metadata enhanced content management in media companies, In *Dissertation for PhD*, Helsinki University of Technology, Espoo, Finland.

Manjunath B.S., Salembier P., and Sikora T., 2002. *Introduction to MPEG-7: Multimedia Content Description Interface*, Wiley.

Mbarki M., Soulé-Dupuy, C. and Vallés-Parlangeau, N., 20805. Modeling and Flexible exploitation of Audio Documents. *In the proceeding of IEEE International Conference on Signal-Image Technology & Internet Based Systems*. Yaoundé, Cameroon 216-223.

Mechkour M., 1995. A multifacet formal image model for information retrieval. In *MIRO final workshop*.

W3C, 2004. Consortium RDF Primer, http://www.w3c.org/TR/rdf-primer/.