

THE MPEG -7 QUERY OF THE E-LEARNING CONTENT

Andrei Marius Gabor¹

Radu Vasiiu²

Abstract– Based on nowadays progress, the quantity of multimedia data that is stored has increased progressively during the e-learning platforms. The value of multimedia information depends on the easiness of having access to it, filtering and managing. Therefore, there is the necessity of organizing and accessing the content efficiently, in order to help its user. The proposed architecture uses MP7QF framework specific to MPEG-7 standard to query multiple database in order to create, distribute and consume the returned digital information, in the e-learning context.

Keywords: MPEG-7, multimedia database, MP7QF framework, e-learning

I. INTRODUCTION

Nowadays the e-learning field is given an increased attention due to the number and diversity of its users, beginning with the large companies and continuing with educational institution.

The e-learning platforms have a unitary structure, have specific procedures for administration and documentation, the accomplishment of didactic activities ensure the interaction between its users or between groups of users, at the same time. The users, that can be an individual or a group of individual's accesses the application based on a user name or on a access password. According to the groups which he/she belongs to, administrative procedures are activated, to create and populate the content, to inform or to consume it.

The professors edit the courses for the students who attend specific classes. The students are given permission to have access and read the courses, by using the user name and the password. Moreover, the students can query different database, out of the system, to collect extra information.

The e-learning platforms are made of: LMS (Learning Management System), LCMS (Learning Content Management System) and web portal. [1].

LMS is a software application for administrating, documenting, checking and reporting the classes, the classrooms the events and the users. So, the main purpose of LMS is to offer the management of the classes and users. This thing can be accomplished through three user levels:

- the student, who uses the content and gains knowledge

- the professor, who elaborates the course and ensure the support for courses

- the administrator, who assigns the courses and the users

LCMS (Learning Content Management System) is a technology related to the management system and aims at developing, managing and editing the content, which will be delivered through LMS. LCMS creates, storages and manages the digital content, as well as creates, imports, manages and searches for items of digital content, called learning object. These objects contain media files, assessment elements, text, graphics or any other object which forms the course content. Reusing of these objects in the context and the content of different courses is necessary many times.

This is, in fact, the philosophy on which the portability of educational application is based, with the help of SCORM standard, implemented by IEEE Learning Technologies Committee [2].

The purpose of this paper is to give a system version which uses MP7QF framework, in order to provide a single access point to different information sources and to digital libraries (images, audio, video, text) in the e-learning context. I will introduce LO (Learning Object) features, and LOM standard, then I will

¹ Facultatea de Electronică și Telecomunicații, Departamentul Comunicații Bd. V. Pârvan Nr. 2, 300223 Timișoara, e-mail andrei.gabor@etc.upt.ro

² Facultatea de Electronică și Telecomunicații, Departamentul Comunicații Bd. V. Pârvan Nr. 2, 300223 Timișoara, e-mail radu.vasiiu@etc.upt.ro

present the architecture proposed to a query system which uses the MP7QF framework.

II. LEARNING OBJECT

In order to ensure the interoperability between the contents provided by the users some standards have been established. These were necessary to describe the educational resources and to manage the users' profiles.

According to [2] IEEE Learning Technology Standards Committee (LTSC), IEEE P1484.12.1-2002 Learning Object Metadata Working Group, the e-learning object is defined as any digital or non-digital entity which can be used or reused in learning technology. Consequently, a learning object can be considered an independent collection between the elements of media content (interactivity, architecture, context) and metadata (used for storage and searching). More learning object are put together by their authors to make up the courses, then they are delivered to the students (Figure 1).

Metadata are data (items of information about data). The "meta" term comes from Ancient Greek and refers to any kind of data which are used to describe the content, the quality, the state or any other aspects of data. Their purpose is to locate, understand and access some data. The metadata information may help the user to get an overview about data.

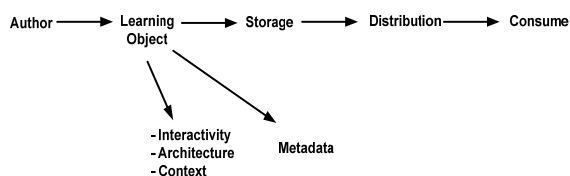


Figure 1

II. LEARNING OBJECT METADATA

Learning Object Metadata describes the content of a course using the high level metadata attributes (semantic descriptions). LOM is similar to Dublin Core metadata standards, but it is specific to e-learning, owing to the delivery of learning attributes, such as the degree of difficulty of a course, the learning period, vocabulary, the structure of the course. Learning Object Metadata describes the learning object and similarly, the digital resources used to help learning technology. The LOM purpose is not only to provide support to reusing learning object, but also to facilitate the interoperability in the LMS (Learning Management System) context. LOM contains a hierarchy of 9 elements (presented in Figure 2), each of them including sub-elements, which can be simple or can contain themselves other sub-elements, the semantic of each element being determined by the context.

SCORM (Sharable Content Object Reference Model) used the XML language in order to

define course structure format, which represents the structure of the classes so that the educational materials to interoperate with other different platforms. The follows an example of XML format for LOM. (Learning Object Metadata)[3].

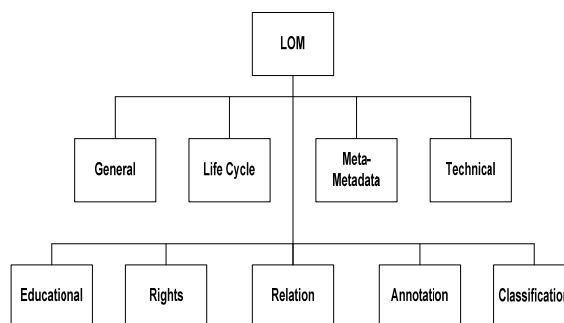


Figure 2 The hierarchy of LOM elements

```
<lom xmlns>
  <general>
    <title>
      <string xml: lang="en"></string>
    </title>
  </general>
  <technical>
    <location type></location>
  </technical>
</lom>
```

List 1 LOM XML format

SCORM reflects the tendency of association of metadata specifications as a specialized subset which describes RLO (Reusable Learning Object) based on the content. This description is made by RIO (Reusable Information Object). RIO may be images, paragraph, texts, video, graphics or presentation slides. RIO strategy is to build up smaller pieces of independent media information, and through the combination of individual RIO the RLO (Reusable Learning Object) structure to be formed. [1].

The MPEG-7 descriptors will be used to provide descriptors of the content by using RIO (Reusable Information Object) in the process of searching and retrieval the content. As a result all learning object metadata will be converted to MPEG-7.

IV. MP7QF FOR E-LEARNING PLATFORMS

Within the proposed system the multimedia queries on the e-learning platforms are based on the MP7QF framework specifications for text, video, images and semantic abstract (annotation). An overall architecture of the query system of MPEG-7 database is described in [4] and is presented in Figure 3, where IQF (Input Query Format) gives details about the syntax and the structure of the query, and OQF (Output Query Format) comments on the syntax and structure of results set.

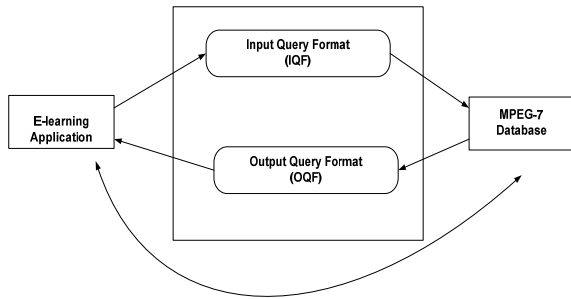


Figure 3 The architecture format for MPEG-7 query

There is not a standard format to metadata query of MPEG-7, that is the reason why MPEG committee have decided framework (standardized ISO/IEC 15938-12) together with a set of requirements (N 8219). The objective of MP7QF framework is to provide an interface for MPEG-7 database in order to allow the users to retrieval the multimedia data. The student who attend the classes of a certain course, can make queries in the multiple database, and the result of the query to be based on his/her preferences and on the history use. The MP7QF framework must meet the following expectations in order to be used on the e-learning platforms:

- to allow the simultaneous searching within the multiple database, the way it is described in Figure 4, both on the e-learning platforms and on the external ones, meaning to allow a single query for the results received from the database.

- to accept the formats which are returned by the query within the process of retrieval the multimedia data.

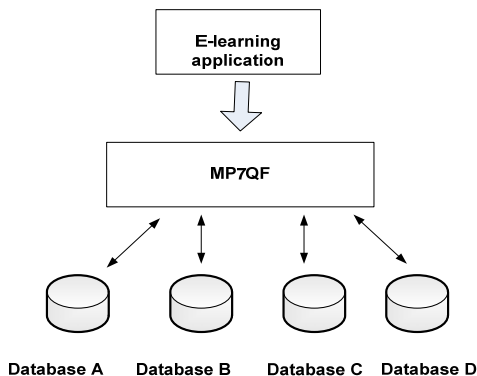


Figure 4 The MP7QF query within the multiple database

The professors and the students can use the results of MP7QF query, results that can be RIO (Reusable Information Learning) or images, video, text either for creating another course or for the use of the content. The user must be able to choose, select and group the multimedia data according to the context and the e-learning content as a result of the query and of the returning of the result.

The MP7QF framework must provide support/help for different queries [5]:

- description queries, which are based on text descriptions (described in List 2), but also using the description and the MPEG-7 description schemes.

- queries based by examples, in which the space and time relations will be used as well as the low level features and the semantic features. The user may select the needed image from the returning results, and if he/she is not satisfied, may reformulate the query.

- queries based on the MPEG-7 standard specification. Color and texture descriptors will be used for query as well as the description schemes.

- queries based on the preferences and the history of the user.

```
<m7qf:Query >
  <m7qf:Input >
    < m7qf:QueryCondition >
      < m7qf:QueryExpression >
        < m7qf:SingleSearch xsi:type ="
m7qf:TextQueryType "retrieval =" contains ">
          < m7qf:FreeTextQuery >
            < m7qf:SearchTerm >Search object
learning</ m7qf:SearchTerm >
          </ m7qf:FreeTextQuery >
        </ m7qf:SingleSearch >
      </ m7qf:QueryExpression >
    </ m7qf:QueryCondition >
  </ m7qf:Input >
</ m7qf:Query >
```

List 2 MP7QF query based on text descriptions

V. CONCLUSION

In this paper I propose an architecture for e-learning platforms. This architecture used the MP7QF framework specific to the MPEG-7 standard in order to query the multiple database. Additionally to the things mentioned above, in the future, I intend to study the way of conversing the MPEG-7 learning object metadata and their query, all these based on the semantics specifics to the e-learning field but also based on the preferences of the user.

ACKNOWLEDGMENT

“This work was partially supported by the strategic grant POSDRU 107/1.5/S/77265, inside POSDRU Romania 2007-2013 co-financed by the European Social Fund – Investing in People.”

REFERENCES

- [1] <http://www.fluidpower.ro/itfps/Etapa1ITFPS.pdf>
- [2] IEEE Learning Technology Standardization Committee, Draft Standard for Learning Object Metadata, 18 April2001.
- [3] Uche Ogbuji Thinking XML: Learning Objects Metadata <http://www.ibm.com/developerworks/xml/library/x-think21.html>
- [4] Mario Doller, Ingo Wolf, Matthias Gruhne, and HaraldKosch. Towards an MPEG-7 Query Language. In Proceedings of the International Conference on Signal-Image Technology and Internet Based Systems (IEEE/ACM SITIS 2006), pages 36–45, Hammamet, Tunisia, 2006.
- [5] Kerstin Renner. Specification of an MPEG-7 Query Language, University of Pasau, Germany 2007.