USING SCIENTIFIC DOCUMENTS FOR DISTANCE LEARNING

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Abstract:
In scientific digital libraries many documents such as publications, technical reports, theses, etc. could be used as basic data supports for distance learning in the universities. But the native structure of these documents is generally not directly adapted to e-learning. In this paper we present our project in which we study how to modify and manage such documents for a better use in distance learning. In the first part, we introduce the definition of a format for scientific documents suited to e-learning, we propose then to use the XML language features to encode and manage these documents. In the next part, we present the documentary system design based on the new structure of the documents and we finish with the description of the prototype that has been made.

Keywords: Digital Libraries – XML - Document– Metadata - User profile – Distance learning

INTRODUCTION
Nowadays the majority of systems for e-learning are based on the elaboration of specific documents and their contents and on the associated frameworks necessary for teaching. Everybody knows that it takes a long time to build documents and even more time to define their contents.

At the same time many scientific documents such as technical documentation, publications, theses, etc. are stored in digital libraries and are only used for booking. Many documents, and therefore many information, remain underused.

The goal of our project is to use such documents for e-learning system and to allow modification on these documents with annotations in order to propose personalised training.

The new documentary system we propose for distance learning permits to use new documents entirely built by the teacher or existing documents. Several functions are proposed, for both of them, to add or suppress annotations and to add or suppress some text in the document.

These modifications appear while displaying the document but thanks to the new structure of document we have defined, they are stored outside of the original document, in individual external specific documents.

Thanks to this modular organisation, it is easy to ensure the links between the main document and the external annotations documents.

In the next parts of this paper we present the standards and the tools used in this project to design the new document structure, the documentary system and to build the prototype

STATE OF ART OF THE STANDARDS FOR THE DOCUMENTS REPRESENTATION
The first step of this project was to make a state of art of the standards formats existing for the documents representation and their management.

THE XML STANDARD
This standard, recommended by the W3C [1], defines XML as the marked up language inherited from SGML. XML [2] permits to define the structure of a document without any interaction on its presentation The form is separated from the content.

Moreover, now we can find many tools able to analyse and manage XML documents.

We can join several documents and show them as if it was a single document, without modifying their contents. This particularity of XML language has permitted to respect some constraints of the project [7] [8].
**THE XSL STANDARD**

The XSL standard defines a language for the expression of style for sheets and offers two important sublanguages:
- **XSLT** : a language for documents transformation. We used this standard for documents presentation.
- **XSL-FO** : a language for documents formatting, so we can choose a presentation adapted to the data storage support (paper, PDA, WAP, etc.).

**THE XML SCHEMA STANDARD**

The XML schema standard permits:
- to control the conformity of the documents according to the type of structure, this is automatically done by many XML editors.
- to define personalised types of elements.

**OTHER XML STANDARDS**

Xpath standard is used to find elements in a document.
Xlink and Xpointer permit to define links between documents.

So, from the state of art about the documents formats used in distance teaching, it has been a question, in a first step, to determine the functions or elements to be integrated in the document, such as direct access to the contents according to the user's profile or the managing annotations possibility.

**THE DOCUMENT STRUCTURE**

We have defined a specific model of document by exploring the possibilities offered by the XML formalism.

The document structure proposed for our distance teaching system is based on an initial document on which various elements such as referenced documents or annotations are pointing for enrichment. These elements are added or modified by the teacher or by the students, according to their rights.

Thanks to the annotations a real interactivity becomes possible between the teacher and the learners. When the annotations done by the students are validated by the teacher, then can become new documents linked to the initial document. (Figure 1)

We have decided to allow two kinds of annotations:

- the **private annotations** : these annotations made by a student can only be accessed by the teacher. This is particularly interesting to make an evaluation of the students' level.

- the **public annotations** : these are technical annotations made by the students and validated by the teacher, they become public if they are pertinent for the scientific topic of the initial document and if the teacher validates them.

The students can access to the documents and to their associated elements according to their access rights. The XSLT standard, via a style sheet, permits to select a document view according to the user rights and preference.
The initial document is based on a physical and a logical structure.

- The physical structure is tied the storage support used for the document.
- The logical structure is represented by several parts of the documents such as chapters, paragraphs, titles of paragraphs, sections, etc. This structure is often used to display the document.

By adding annotations in the initial document we define a new type of structure for the document named "semantic structure".

When annotations are included in the initial XML document, we add specific "tags" associated to information stored in the annotation file. It is possible to add and to suppress annotations, so that the semantic structure is dynamic and leads to a better personalisation of the document.

Most of our documentary system functions are then based on this semantic structure.

THE DOCUMENTARY SYSTEM

In parallel, we have studied and defined a suitable documentary system, for the exploitation of these documents within the framework of distance teaching.


In the documentary system, a document follows a cycle including several steps (Figure 2):

- The *creation* of the document according to the defined structure. The structure of the document is based on XML schema. The DTD (Document Type Definition) includes some Dublin Core metadata and some specific metadata (for example : citation, student level, netographie, etc.)
- The *insertion or storage* of the document in the database according to users' access rights.
- The *consultation and modification* of the document characterised by the consultation or the annotation possibilities given to the users. XSL style sheets permit to display documents or parts of documents according to the user profile. We access to the documents by means of views.
- The *update* of the document consisting in the validation of the annotations made by students or teachers.

**Figure 2 : The Framework and data flow**

*THE DATABASE*

The documents are stored in a database.

The data stored in the database are represented by the following tables and attributes: according to this notation:
**THE PROTOTYPE**

**THE PROTOTYPE ARCHITECTURE**

A prototype has been developed to validate our solution.
For this prototype we have defined a three tiers software architecture (Figure 3) which permits an easy access to the data thanks to the WEB

- **Client Tier** : in this part the user can make requests and read the results.

- **Applications Tier** : this part processes the requests, sends them to the Data Tier and sends the results to the client after formatting.

- **Data Tier** : this part collects the requests from the Application Tier, accesses to the data in the database and sends the data to the Application Tier

In our prototype we have defined specific software tools :

- "beans" to access to the data in the database and to manage the data flow used by the system answers
- "servlets" to present the data to the user and to control user's requests.

**GRAPHICAL PRESENTATION OF THE PROTOTYPE**

The connection to the system is protected by a login and a password.

Once the connection done the system proposes interactive screens which permit to select a teaching level and a document. The system functions are accessible from specific buttons.

The teaching areas and levels are displayed on the left part of the screen. After selection of an area and a level, the list of the possible documents is displayed on the right side of the screen. The selected document appear on the screen and some specific buttons are accessible to perform actions such as annotation creation or annotation suppression. (Figure 4).
Figure 4: Level teaching and document selections

On the right part of next picture (Figure 5) we can see how it is possible to make a public or private annotation. The production of a new annotation will appear on the document after validation thanks to a specific button.
Figure 5: Annotation creation

It is also possible to see all the created annotations at the same time and to suppress one or several of them.

Documents can easily be added or suppressed from the database according to user's access rights.

CONCLUSION

This project has permitted to evaluate the possibilities of using scientific documents for distance teaching. So, we think it is possible and interesting to build a documentary system for distance learning by reusing scientific documents.

In this project, the interactivity between the students and the teacher is provided by the possibility of adding annotations to the initial document without modifying its structure and content, using the XML standard and its associated tools.

The initial documentary system can be annotated under teachers’ control, so that it can become better suited to users’ needs and expectations.

The architecture proposed gives an easy access to the documentary system using the WEB.

Our documentary system is based on a modular organization which permits evolution and extensions.
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