

## AN AUTHOR SYSTEM FOR THE PRODUCTION OF ADAPTATIVE COURSES

*Youssef Belqasmi*<sup>1</sup>, *Zineb Bentaleb*<sup>2</sup>, *Amine Benkiran*<sup>3</sup> and *Rachida Ajhoun*<sup>4</sup>

<sup>1</sup> RIM, École Normale Supérieure de l'Enseignement Technique Mohammédia Maroc [belqasmi@hightech.edu](mailto:belqasmi@hightech.edu)

<sup>2</sup> RIM, École Mohammadia d'Ingénieurs Rabat Maroc [bentaleb@emi.ac.ma](mailto:bentaleb@emi.ac.ma)

<sup>1</sup> RIM, École Mohammadia d'Ingénieurs Rabat Maroc [benkiran@emi.ac.ma](mailto:benkiran@emi.ac.ma)

<sup>1</sup> RIM, Institut d'Etudes et de Recherches pour l'Arabisation Rabat Maroc [ajhoun@emi.ac.ma](mailto:ajhoun@emi.ac.ma)

### Abstract

*The recent technological evolutions in communication and multimedia have helped increase the possibilities of distance learning. Indeed, thanks to the systems of tele-learning set up on the basis of these new technologies, the learners are not subjected any longer either to constraints of space (presence in a classroom) or to constraints of time (presence in a session). However, the majority of the systems which exist at present, notably on Internet, offer, to the learners general and stereotypical courses, without taking into account the specificities of each one of them in terms of profiles (capacity, spoken language objectives of the training and the learning environment). Moreover, the evolution of the course is left to the initiative of the learner, a fact that may entail the non compliance with the educational scenarios.*

*With this situation in mind, the Unity of Research and Training RIM (Networks, Computer and Multimedia) at Mohammadia School of Engineers and within the framework of its project SMART-Learning (System for Multimedia Adaptative and Cooperative Tele-learning) is experimenting with a system dealing with all the imperfections mentioned above. Indeed, SMART-Learning gives to every learner a course generated dynamically in accordance with his profile and environment of learning. The evolution of the course is managed by the system, on the basis of the learner's capacity (speed, background ...) and of the educational rules pre-established by the author of the course.*

*The SMART-Learning system puts forward an approach based on the notion of the generic course. The latter is made of the contents meant to all the learners in accordance with all the profiles. It contains also all the educational strategies defined by the author. When a learner uses the system, he supplies his profile, in accordance with a pre-established model. The specific course is generated for him dynamically. If the profile is modified following an interaction with the system, such as an evaluation, the course will be automatically regenerated in order to take into account the new knowledge acquired by learner.*

*The courses put at the disposal of the learners by SMART Learning are often developed by teachers with little*

*knowledge in the computer science field. In order to insure the conformity and to simplify the courses produced with the SMART Learning mode. Smart Learning aims at supplying them with an author system based on graphic interface.*

*In this paper, we will show how can the system help the authors to conceive pedagogical sequences. Starting from the principle that an educational sequence can also be made of various sequences, the system supplies the authors with a way to manage the encapsulation and the hierarchisation of the sequences. It offers also the possibility to define the content of every educational sequence in accordance with all learners profiles.*

**Keywords :** *Tele-learning, profile, educational sequence, generation, edition, temporal relations, verification of the consistency.*

### 1. INTRODUCTION

The recent technological evolutions concerning communication and multimedia permitted to increase possibilities of training from afar. Indeed, thanks to systems of Tele-learning developed by using these new technologies, learners are not more nor submitted to constraints of space (presence in a room of course) nor to constraints of time (presence to a sitting) [1]. However the majority of systems that exists currently, notably on Internet, offer standards and stereotypes courses to learners without taking account of specificities of each of them in term of profiles (capacity, language, objectives of the formation...) and of learning environment[2]. The evolution of the course is let on the learner initiative without respecting educational scenarios.

Conscious of this situation, the Unit of Research and Formation RIM (Computer network and Multimedia) in college Mohamadia of engineers (Ecole Mohammadia school d'Ingenieurs) and in the setting of his SMART-Learning project (System for Multimedia Adaptive Cooperative and Tele-learning) is experimenting a system filling the quoted imperfection whole previously. Indeed, SMART-Learning puts to the disposition of every learner a course generated dynamically according to his profile and his environment of training. The evolution of the course is managed by the system according to the learner (speed...)

and of the educational rules predefined by the author of the course.

## 2. PRESENTATION OF SMART-LEARNING

Generic Courses :

The SMART-Learning system proposes an approach based on the generic course notion. It is composed by contents of all learners according to all profiles. It also contains all definite educational strategies by the author. When a learner uses the system, he provides, in accordance with a predefined model, his profile. The specific course is generated him dynamically (Fig .1). If the profile is modified following an interaction with the system, an evaluation for example, the course will be regenerated automatically in order to take account of the new knowledge acquired by learner[3].

Of this manner, we note that SMART-Learning assures the adaptation of courses products for Learners with their initial profiles and with their evolutions during the training.

The system author must give to the author, the necessary tools to achieve the generic courses. These tools must be sufficiently simple and explicit so that they are to carried it of pedagogues or formative that don't have very advanced knowledge forcing in the domain of the data processing.

In the following section we are going to present SMART-Learning how assures the educational script respect predefined by the author of the course.

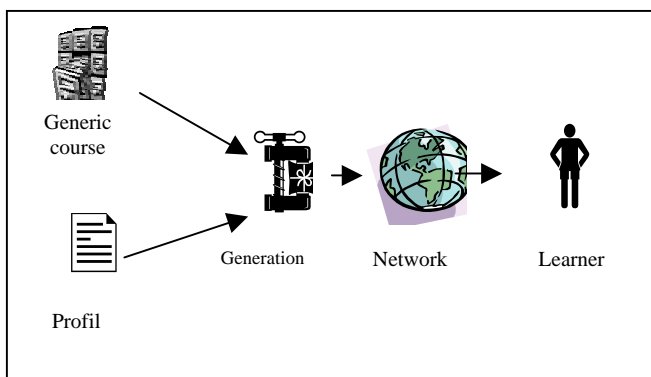


FIG. 1  
SPECIFIC COURSE PRODUCTION PROCESS

Pedagogic course :

Once the individual course is generated for a learning given, the one starts here with the first sequence pedagogic(SP), finished the passage once toward the following educational sequence doesn't make himself of an uncertain manner but according to an educational graph (Fig.2) established beforehand by the author of the course. This mechanism permits to assure the acquirement, by learning it, of all concepts aimed by every sequence pedagogic[4].

The system author must put to the author's disposition a tool permitting him to elaborate the educational graph, to formulate conditions of passage of a sequence toward an another one. The author will also have need of a tool for the verification of the consistency of the graph.

In the following section our are going to see the XML language how and tools partners have been used for the adaptive course generation.

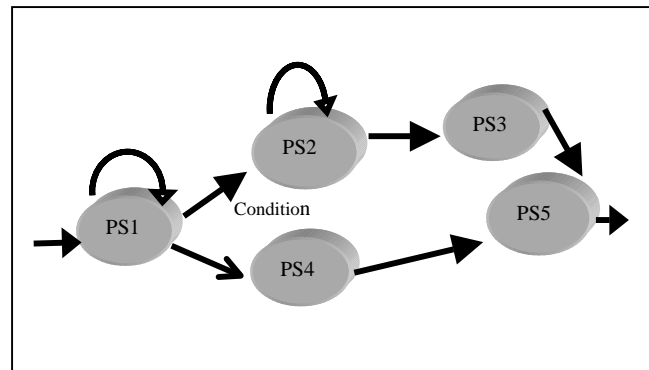


FIG. 2  
EDUCATIONAL GRAPH

Generation of courses adaptations:

To Facilitate the diffusion of courses on Internet, the language of course description chosen is XML " expandable Mark-up Language " [5], recognized for its easiness to describe some complex documents. It permits to get the structured documents, and completely independent of the presentation.

The modelling of courses is assured by the notion of DTD « Document Type Definition » that is a document models serving reference for the XMLS documents. In the setting of our project it permits to assure the consistency of the courses product structure.

As we specified him previously, information of presentation don't represent in the XML document. All attributes are defined in other a document called " leaf of styles " for

which exists several languages of specification. The language the used more is XSL.

The generic course is described in a XML document in accordance with a DTD. From the profile of learning it and of the document of XSL presentation, partner to the XML document, is generated by an application a document specific XSL (Fig.3). The combination of the file generic XML and the document specific XSL gives place to the specific course. To this course are added mechanisms permitting to assure the respect of the definite educational course by the author [7].

The system author must provide to the author the means to create and to publish the XMLS documents and XSLs. The author must also arrange a tool permitting him to verify the conformity of courses with the DTD.

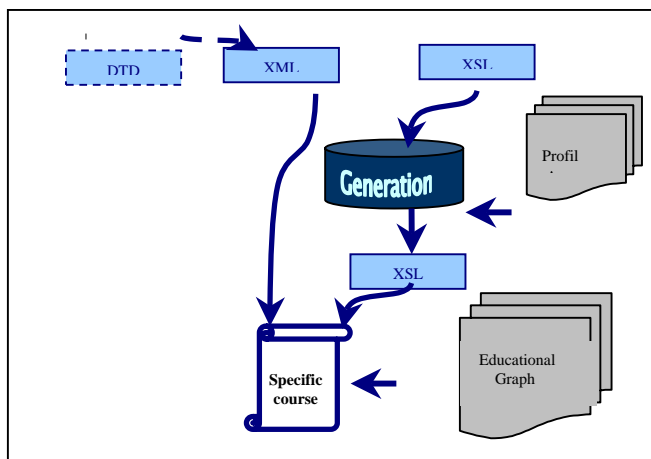


FIG.3  
GENERATION OF COURSE

### 3. SYSTEM AUTHOR FOR SMART-LEARNING

Courses put to disposition for the learner SMART learning are developed often by pedagogues with little knowledge in the computer domain. In order to facilitate the task of these authors, SMART Learning aims to provide them a system author to basis of interfacing graphic :

- the creation of the educational scripts, while specifying the different sequences, their contents and relations that bind them
- The verification of the educational script consistency
- The expression of the synchronization (logical, spatial or temporal) brings in the different objects

media (Text, Video ...) constituent the educational sequences

- the verification of the consistency of the synchronization at the level media
- The edition of documents generic XML and XSL
- The verification of the document conformity XML products with the definite DTD.
- The presentation of documents products to permit the setting up of an edition process incremental

In the remainder of this article we are going to especially put at the level the accent on the expression of the synchronization media, seen that the other asked functionalities present less difficulties because they already exist and require an adaptation only (Publisher XML/XSL, parseurs). On the other hand verification will make the object of an ulterior presentation.

In the next section we are going to pass in magazine the different techniques of expression of the synchronization that exist.

Languages of expression of the synchronization:

The description of a multimedia document takes place through the intermediary of a language. Objects are characterized by attributes. The objective is to provide a sufficiently expressive language so that the author can represent the most faithfully possible its document.

The first type of languages rests on an approach structural[8], that is that the language leans on the structure of the document in order to be able to describe it. The second type of languages called operational languages that rest a lot more while doing on the formulation of the presentation abstraction of the structure of the document. Among the tools multimedia based on this approach, there are ToolBook, Director and Flash. ToolBook and Director use all two one language of script. The temporal edition differs, ToolBook using the metaphor of the book and Director of the time-lines (absolute time axis).

The advantage of this language type is that they offer a strong expressive power. But, they present a major inconvenience in the case of our system : 'they are destined to an aware public. A solution for landing this difficulty of training is to use The technique of Flash permitting to surpass this difficulty, view that it leans on the total encapsulation of the language by one user-interface, but in counterpart, the power of expression decreases.

Another approach consists in expressing the synchronization between objects just media while declaring the temporal relations that exist them. This type of language is called declarative language.

We are going to start with defining temporal elements, the temporal relations and after the expression to basis of the these relations.

A multimedia element can be represented temporally by three information:

- Its instant of beginning.
- Its length of presentation.
- Its instant of end.

The temporal relations permit to describe the way whose elements multimedia must be combined temporally to produce a sequence.

The expression of the synchronization comes back to the temporal relation formulation then between medias. We arrange two types of representations [8] :

1. A representation founded on instants. In this case, a multimedia element, that it is logical or of basis, is described in a script by one instant of beginning and one instant of end, as in Firefly [9] and Maestro.
2. A representation founded on intervals. A multimedia element is considered like a temporal entity of basis described by its length as in OCPN and Cmifed [10], Madeus [8].

In the case of our system we opt for the expression to basis of intervals because it permits a more compact description of the synchronization and assure the possibility of encapsulation what facilitates the edition a lot to even see the process of edition incremental.

The simplicity of this technique resides in the fact that the work of the limit author to declare the temporal relations, by the means of intervals, bring in the different medias for example by the slant of a graphic interfacing and it is the system that is in charge of calculating instants of presentation and stop of medias (resolution of problems to basis of constraints).

The system author under prototype will permit to increase the number of adaptive courses considerably put to disposition learners by SMART-Learning through the web. Indeed, the majority of pedagogues and teachers will be capable to use this system to produce, merely, of the adaptive courses without necessity of a big restraint of the computer tool. It is important to signal that the verification of the consistency is a central element of the system and it makes the object of works in progress.

#### 4. REFERENCES

[1] BENKIRAN A., AJHOUN R : SMART Learning : System for an Adaptive and Cooperative television-teaching, VIIèmes International Days of Technology - Beirut 2-5 May 2000

[2] AJHOUN R., BENKIRAN A., A. Mahamane, TO Framework for Adaptive and Cooperative Learning INTERNET for: Tea SMART-Learning. Proceeding of INET2000, Yokohama Japan, July 2000.

[3] BENKIRAN A., AJHOUN R., Belqasmi Y. (2000) Adaptability of Multimedia Shoppings using Intelligent Hypertexts, proceedings of TechEd2000 - Technology in Education International Conference, Palm Springs, California, March 2000.

[4] AJHOUN R., BENKIRAN A., Modeling Adaptive Shopping for telelearning, proceedings of ITHET2000 tea International Conference one Information Technology Based Higher Education and Training, Istanbul, TURKEY, July 2000.

[5] Michard A. (1999) XML language and applications 1999 Edition Eyrolleses

[6] Bosak J. XML, Java, and tea future of tea Web Sun Microsystems, 1997,

[7] AJHOUN R., BENKIRAN A. To Methodology for adaptive shopping one Web tea, Proceeding of MCSEAI2000, Sixth From the Maghreb Conference in Data processing, Fes, Morocco November 2000.

[8] N.Layaida, Madeus, System of edition and presentation of documents structured multimedia, thesis, University Joseph Fourier, June 1997,

[9] Mr. Buchanan, P.Zellweger, " Automatic Temporal Layout Mechanisms ", proc ACM of Multimedia 97 Conference, anaheim, August 1993,

[10] G. Rossum, J.Jansen, K.Mullender, " CMIFed: has Presentation Environment for portable Hypermedia Documents ", proc ACM of Multimedia Conference, California, 1993,