

MAI: An Authoring System for Designing Interactive Learning Modules

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Abstract: New Information Technologies (IT) offer a new way for teaching and learning. Rather than simply duplicate old learning materials and make them correspond to the new IT tools, it is essential to reconsider the learning process using computers. The authoring system MAI presents a new methodology for online learning based on an approach using concepts, dividing the course into “units of learning”, structuring the training with the help of a “navigation chart” and using media objects to illustrate the basic concepts. This authoring system is designed to support both creation of learning material and online learning.

Keywords: e-learning, authoring system, demonstration, hypertext, multimedia

1 The concepts

Learning with paper support remained for a long time the traditional way to reach knowledge. New Information Technologies make it possible to use the computer and the Web to create interactive learning material including textual information, simple images, animated images, sequences of simulation, video or sound sequences. It is now possible to arrange this material in a given way and to use different media objects for a better illustration of the concepts, making them less abstract.

The methodology of learning proposed in the authoring system MAI (“Module d’Apprentissage Interactif”) aims to improve the effort of learning and to make it more efficient. It is based on an approach using concepts. The learning material is parceled into simpler and more concise entities. The various parts comprising the material are gathered and presented for learning in a navigation chart. Different media objects are used to illustrate the concepts.

The system distinguishes between two types of users: the instructors and the students. The instructors create or modify learning material and the students use this same material for learning.

A course is visualized as a directed graph (navigation chart) containing nodes (simple nodes and objective nodes) connected to one another by directed arcs. The orientation of the arcs enables the teacher to suggest a learning path for the students.

A “unit of learning” is linked to each node of the navigation chart. Each unit of learning represents a concept. For example, in a course of Genetic Engineering, the “protein” concept could be a unit of learning. A unit of learning consists of a core and peripheral resources. The core is a linear set of pages, which deal with the presentation of basic information. The peripheral resources (media objects) help to illustrate this basic information.

The instructor also has the option to add a questionnaire to each unit of learning for self-evaluation.

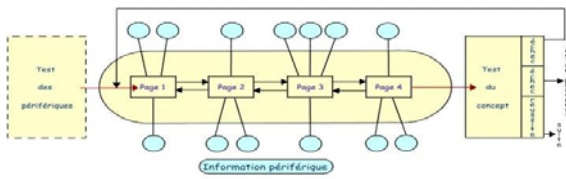


Figure 1: The architecture of the units of learning

A complete course of « Genetic Engineering » was implemented in French according to the methodology described above. Its aim was to explain the cloning of a gene on the basis of a genomic DNA bank (Housen et al, 2002).

2 The Authoring System

To make the authoring system MAI a *good* teaching tool (Forte et al, 1993), the main considerations taken into account during development were to share the data among the various users, instructors and students and to offer the possibility of using the authoring system with or without a network connection.

In order to satisfy these constraints, the system was built using a client-server architecture. The “server” ensures the persistence of the data in a database and implements an application layer allowing the handling of the data stored in the database. The “client” deals with the presentation of the data to the users. This architecture makes it possible to distribute “objects” on a network and to remotely activate the methods associated with them. A database stores all the contents created by the instructors: the courses, the navigation chart and the units of learning of the courses as well as the multimedia resources that they use. The standard for storing the contents in the database is HTML.

The adopted architecture has the advantages related to the assembly of components in a network, i.e. the centralisation of the objects on the server and the construction of a light client based on services offered by the server. The technology used is Java RMI, which facilitates calling methods between Java objects running on different machines.

The authoring system MAI is distributed in the form of standalone Java applications. It integrates a text editor making it possible for the instructors to edit text and to give best effects to the contents.

Normally, the authoring system is used with a network connection. The instructors create the learning contents on their own workstations and store them in the database on the server. The students connect directly to the server. They can then interactively learn the contents offered to them using copies of the required elements on their own workstations.

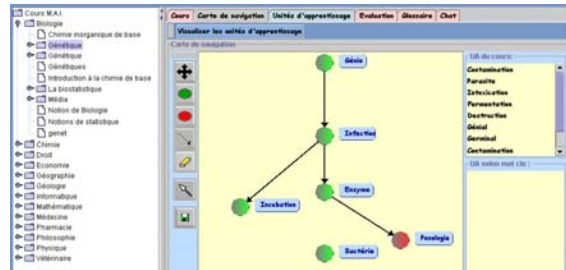


Figure 2: An example of the MAI interface

Both the instructors and the students can also use the software without a network connection. For the instructors, the learning material that they create is stored temporarily on their local machines. This material can be transferred later to the database on the server as soon as a connection is available. The students can download a course onto their workstations and work offline. They can also write a copy of the course onto a CD.

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