How to design a dynamic adaptive hypermedia for teaching ?

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Abstract

For many years, hypermedia has been a new research area in the field of computer aided teaching systems. Three kinds of systems have successively appeared: first classical hypermedia, then adaptive hypermedia and finally dynamic adaptive hypermedia. Dynamic adaptive hypermedia are more efficient, but they are rarely multimedia and hardly ever use the Internet to send courses. This paper introduces the architecture of METADYNE, a dynamic adaptive hypermedia system. This system allows to create and to distribute multimedia-based courses adapted to the learner, and to transmit courses via the Internet.

Key words

Adaptive hypermedia, Multimedia, Computer aided teaching, Internet.

1. The models of METADYNE.

METADYNE is a system of conception and distribution of courses via Internet network. In addition to intrinsic characteristics of dynamic adaptive hypermedia systems [8], it must:

· propose uniform and really multimedia courses,
· take into account the knowledge level of the student as well as his tastes or his goals,
· offer tools allowing to represent the knowledge of a group of teachers, allowing them to put their knowledge in common and allowing the system to perform its adaptation [4].

As we can see in the figure #1, the architecture of our system is based on four classical components: the domain model, the student model, multimedia database and the courses generator. We are going to examine the first three ones.

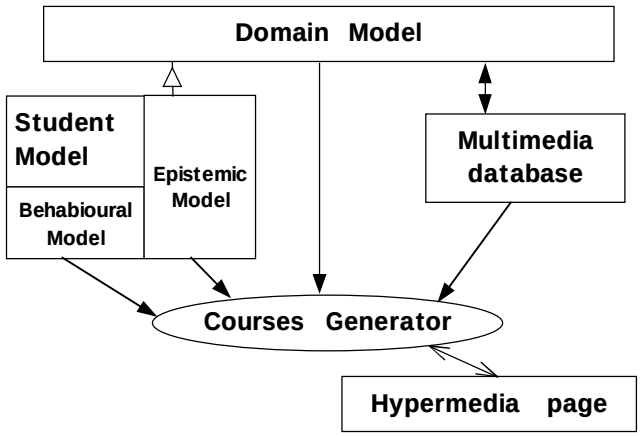

Figure 1 – The different models of METADYNE

1.1. The domain model.

We use a semantic network to represent this model. There is appropriateness between the couple concept-relations of the semantic network and the couple page-links of the hypermedia system. The concepts of this network are linked together with four kinds of relation:

1. *" is sequentially composed by "*, enables to brake up the teaching of a concept into the teaching of a succession of concepts.
2. *" is derivated in "*, enables to show a concept through different point of view.
3. *"needs the knowledge of"*, enables to select what has to be known to understand the concept.
4. *"is able to be helped by the knowledge"*, allows to urge the student to go and see one concept as well as to initialize user model on the current concept.

The two last relations are weighted according to their importance. Moreover every concept and relation are labeled with the name of the teacher who has built them, allowing the system to may have different points of view (the point of view of one teacher, a set of teachers or all the teachers).

1.2. The student model.

Besides the domain model, a good representation of student model is essential. As researches about user model is a full filed of artificial intelligence, our goal is not to perform existing model. So we decided to use a model introduced in [7] and [1]. This model is made up of two sub-models: an epistemic model, and a behavioral model.

The epistemic model allows the system to know what the learner is supposed to know or not to know. As this knowledge is closed from the knowledge represented by the domain model, we use the overlay technique. Then each concept of the domain model is linked with the epistemic model of the learner by a weighted relation. There are different techniques [2], and we decide to use a couple of value for the weights. The first value allows the system to know if the student has already been evaluated for a concept, and if it is true, the second value is this evaluation. Moreover, this last value can change according the idea of mnesic network of [6].

Whereas the epistemic model is always used in teaching system, the used of behavioural model is often limited or lacking. Our adaptive system wants to be as near as possible from the student, i.e. the system must take into account his preferences, his goals and his intellectual abilities.

1.3. The multimedia database.

The third main component of our system is the multimedia database allowing the system to introduce every concept. This database is made up of "elementary brick" [3]. Each brick is associated with one concept of the domain model. They are characterised by three attributes : the cognitive type, the cognitive level and the physical type. The cognitive type allows the system to sort media according to their teaching nature (for instance an introduction, a definition, an exercise, an abstract, etc). The cognitive level allows the system to associate a media with a knowledge level that is required for a well understanding of the information introduced. The physical type allows the system to specify the multimedia quality of each media (text, picture, video, interactive application, etc…). These attributes allow the system, when it built a hypermedia page, to follow instructions defined in the behavioural model.

2. Software architecture.

As the figure #2 shows, the software architecture of our system is not a classical client-server architecture but an homogenous architecture. Indeed all those components use object technologie. The client use java applets, the database is object-oriented (MATISSE), and a distributed objects server [5] is used to allow clients and the database to communicate.

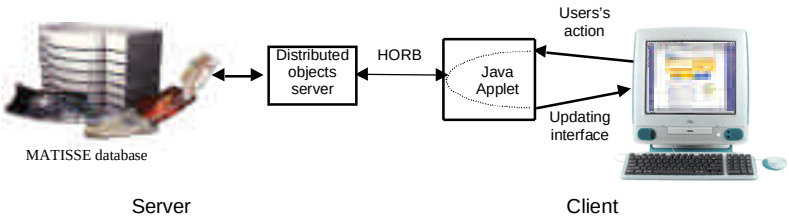

Figure 2 – The software arcitecture

3. Conclusions.

Dynamic adaptive hypermedia systems are a real new way of researches compare to the other computer aided teaching system. Although the architecture of our system looks like the architecture of some another system, it stands out by:

· our will to produce real multimedia courses,
· our will that the adaptive system takes into account not only the student knowledge, but the student preferences and goals too (the system is not only an adaptive system, it is an adaptable system too),
· our will to offer to the teacher a tool which allows them to put their knowledge in common,
· our homogenous software architecture.

4. References.

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