On the Use of E-learning Standards in Adaptive Learning Systems

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Abstract

In spite of the advantages reported by the research community, Adaptive Learning Systems have failed to gain widespread acceptance. A critical factor that will determine the popularization of these systems is the possibility of using the standardized data models for exchanging and reusing learning resources.

1. Introduction

Adaptive Learning Systems (ALSs), deal with appropriate personalization and adaptation techniques (smart curriculum sequencing, navigation guidance, intelligent problem generation and analysis of solutions, adaptable interfaces, adaptive contents, etc.) in order to maximize the effectiveness of learning. Due to the potential advantages provided by ALSs, it is foreseeable that future “real-world” e-learning platforms incorporate adaptive techniques. However, it is essential to incorporate standardized data models to guarantee contents and service interoperability.

2. Data Models in ALSs

ALSs use proprietary data models to operate, being the most relevant ones as follows:

- **Student Model.** It stores relevant information about the student (personal data, preferences, learning style, disabilities, experience, current capabilities, etc.).
- **Domain Model.** It is the repository for storing and structuring the learning contents and the overall knowledge on a particular domain.
- **Environment Model.** It includes a description of the capabilities of the hardware and software used by the student in a particular learning session.
- **Adaptation Model:** It contains the specific inferential rules that define how other models are to be combined in order to provide the actual adaptation.

These different models are used and updated by an Adaptation Engine, an inference control mechanism, to personalize the learning process for appropriate learning experiences.

3. Standardized Data Models in ALSs

Results from the standardization process [1] show that proposals exist that can be mapped or transformed into each of the proprietary data models described in Section 2. However, a deeper study of these proposals evidence that they present some problems for the proper utilization of them in a real adaptive systems. The main problems that can be found are:

- Current standards aimed to store the organization and sequencing of educational content aggregations (entire courses or parts of them) just take into account previous actions and the “knowledge” acquired by the student in the course. They do not consider other factors like students’ learning style to describe the dynamic behaviour of the aggregation.
- Most vocabularies proposed for many of the different elements within the e-learning standardization process have a reduced value space set that do not properly cope with adaptation needs. Also, the defined vocabularies as described in the specifications are too ambiguous. Formats like the IMS consortium’s Learner Information Package (IMS-LIP) are mainly oriented to administrative and classification purposes. Thus, it results difficult for an Adaptation Engine to fully “understand” issues like students previously acquired knowledge or their preferred learning style.
- Lack of explicit relationships among the different proposals. For example, it is not straightforward to match the Competency element category from the IMP-LIP specification to the LOM metadata elements.

4. Conclusions

The ALS community needs to add semantics and suitable extensions to those data models being standardized at present. “Machine-readable” ontologies, defined using languages like DAML+OIL or OWL, will be of great utility to cope with this.

5. References