Providing SCORM with Adaptivity*

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ABSTRACT

Content personalization is a very important aspect in the field of e-learning, although current standards do not fully support it. In this paper, we outline an extension to the ADL SCORM (Sharable Content Object Reference Model) standard in an effort to permit a suitable adaptivity based on user's characteristics. Applying this extension, we can create adaptable courses, which should be personalized before shown to the student.

Categories and Subject Descriptors: H.4.0 [Information Systems Applications]: General.

General Terms: Standardization.

Keywords: AH, SCORM, adaptivity, e-learning.

1. OVERVIEW

Due to the rapid progress of e-learning, diverse standardization efforts have emerged. Among them, ADL SCORM [1] has reached great acceptance, since it brings together several standards of various standardization institutes in different fields of e-learning. Although this standard repeatedly mentions the importance of personalization in education, its current adaptation abilities are very restricted and focused on two main aspects.

On the one hand it allows to define different organizations for the same course (see Fig. 1). The LMS (Learning Management System)[1] is the responsible for deciding which one suits the user profile better —using the metadata available for this organization— before the student begins the learning experience. On the other hand, sequencing information allows establishing a set of rules that the LMS uses to select the next activity to be shown, based only on parameters corresponding to the concrete course, for example, if the user has fulfilled the objectives of a previous activity. These parameters are stored in the SCORM Data Model and they are mainly related with the objectives of precedent activities in the course. SCORM does not permit taking into account external aspects such as user's preferences or learning background.

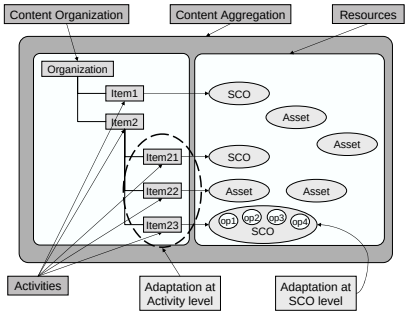

Figure 1: SCORM Content Aggregation Model

The possibility of defining different organizations and sequencing information is not enough to provide courses that can be adapted to user's needs. To alleviate this lack, we propose a solution to extend the SCORM standard with the purpose of providing it with the adaptation ability. In this manner, the course creator is able to offer a series of options instead of a fixed one in some points of the course, indicating, for each of them, the characteristics of the target user.

This extension is based on adaptation parameters, obtained from user's characteristic in the user profile and adaptation rules, conditioned by those parameters. It offers adaptivity at two levels (see Fig. 1): at activity level and SCO (Sharable Content Object) level. In the SCORM terminology, an activity is a structured unit of instruction. Adaptation at activity level consists in offering different ways of achieving the intended objective for this activity, i.e. studying different sets of subactivities depending on user's preferences and background. Adaptation rules are provided which relate adaptation parameters with the appropriate set of subactivities to be shown.

On the other hand, a SCO represents a single launchable learning object which is able to communicate with a LMS —whereas an Asset is an electronic representation of media that cannot communicate with an LMS. Adaptivity at this level is achieved by defining self-adaptive SCOs, which have several behaviour options and decide to use one of them by means of adaptation rules, depending on the values of user's preferences and background.

2. SCENARIO OF OUR PROPOSAL

It is worth mentioning that this proposal takes place into a broader work whose objective is developing t-MAESTRO

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[1]In e-learning terminology, the term LMS is used to refer to the system designed to deliver, track, report on and manage learning content, learner progress and learner interactions.

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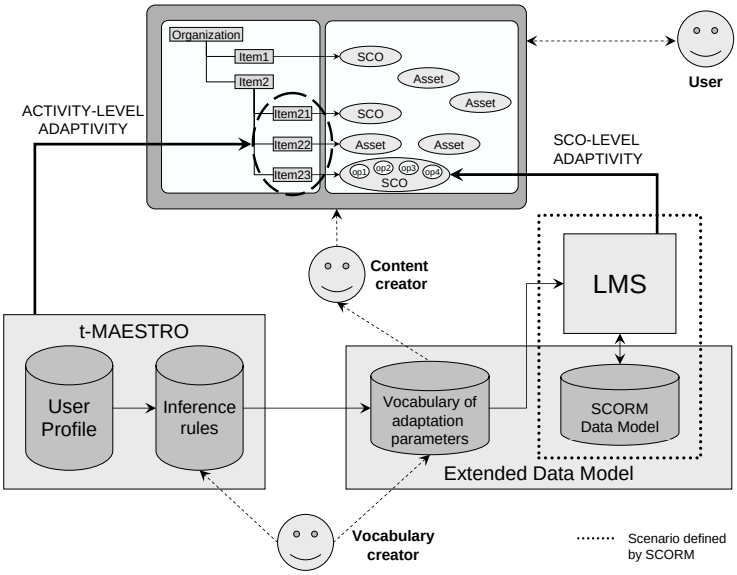

Figure 2: Target scenario

(Multimedia Adaptive Educational SysTem based on Reassembling TV Objects), an Intelligent Tutoring System (ITS) for t-learning —education over Interactive Digital TV. We will allude to this ITS all through our explanation, but the extension proposed equally works using any other one.

In Fig. 2 the scenario for our proposal is shown, where we can identify three different roles: the vocabulary creator, the content creator and the user. The two systems needed to make the educational process possible are also shown: the ITS (in our case, t-MAESTRO) and the LMS.

First, the **vocabulary creator** extends the SCORM Data Model with new vocabularies of adaptation parameters and provides t-MAESTRO with inference rules. These rules permit to obtain the actual values of these parameters from the user's characteristics stored in the user profile. They also make possible that the proposed extensions work independently of how the user profile is stored in the ITS.

Next, the **content creator** creates SCORM-conformant courses. He/she is responsible for searching, organizing and labelling learning content. Concerning our extension, he/she should know the available adaptation parameters and generate the appropriate adaptation rules for the activities and SCOs based on these parameters.

t-MAESTRO maintains the user profile, which stores the user's preferences, knowledge and history. The existence of this profile is basic in order for the ITS to keep up to date the actual values of the adaptation parameters using the inference rules for these parameters provided by the vocabulary creator. These values allow t-MAESTRO to apply adaptation rules to adapt the course at activity level.

Finally, the **LMS** has the responsibility of storing the actual values of the adaptation parameters and showing the course to the **user**. This system has to provide the values of adaptation parameters to self-adaptive SCOs when requested, so as they can resolve the adaptation rules and show the appropriate behaviour to the student.

3. EXAMPLE OF ADAPTABLE COURSES

We will now expose an example of the two levels of adaptation considered in the proposed extension. The user is going to study a Spanish course with the structure shown in Fig. 1. The activity named `Item2` deals with the order of adjectives. It has 3 subactivities, the first one is an introductory explanation of the grammar, the second one is a practical exercise and the last one is for revision of the previously learned concepts.

For adaptation at activity level, the content creator creates a set of rules that contemplate which subactivities are appropriate for each user depending on his/her characteristics. For example, the order of adjectives in Spanish should be easier if the user's tongue is a Romance one, e.g. French, —due to the similarities between those languages— than if it is not, e.g. English. For the French one, it should be enough to study the revision activity, while the English one should better study the three subactivities. The adaptation rule would be "`If motherTongue equals French, show Item23; else show Item21, Item22 and Item23`". When this course arrives to t-MAESTRO, it should apply this rule with the actual values of the adaptation parameters for the concrete user in order to select the appropriate set of subactivities for him/her.

Concerning adaptivity at SCO level, a self-adaptive SCO is offered for the revision activity aforementioned. In this SCO, a video in Spanish with subtitles is shown in order for the user to learn where the adjectives are placed in normal speech. Several videos are available to fulfil the needs of users with different preferences. Adaptation rules are provided to indicate which one is appropriate for a particular user according to his/her preferences, in this case his/her favourite sport. For example, if the user profile contains the information that he/she likes tennis, a video with a summary of a tennis match will be shown. The SCO has to ask the LMS for the actual values of the adaptation parameter `favouriteSport` it needs to resolve the adaptation rules and adopt the correct behaviour.

4. REFERENCES

[1] ADL. Sharable Content Object Reference Model (SCORM). `http://www.adlnet.org`, 2004.